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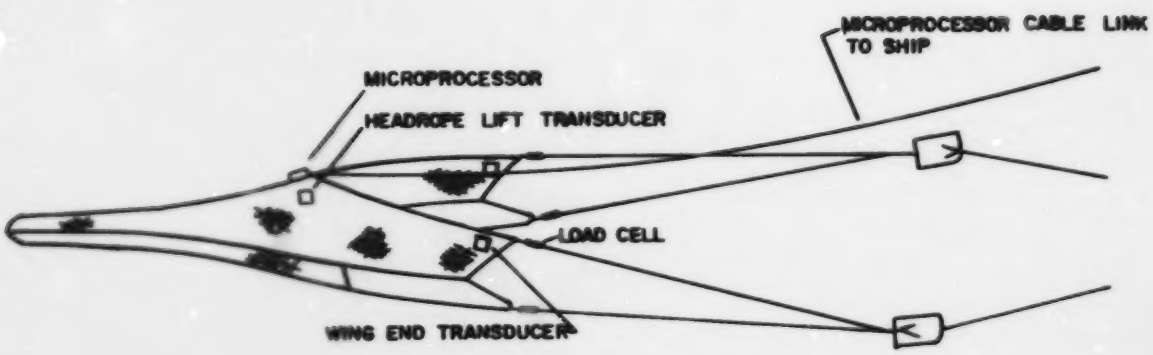
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF FISHERIES

Preliminary Report
on
Groundfish Trawl Experiments 1979-1981



NOVEMBER 1981

DEVELOPMENT BRANCH REPORT NO. 25

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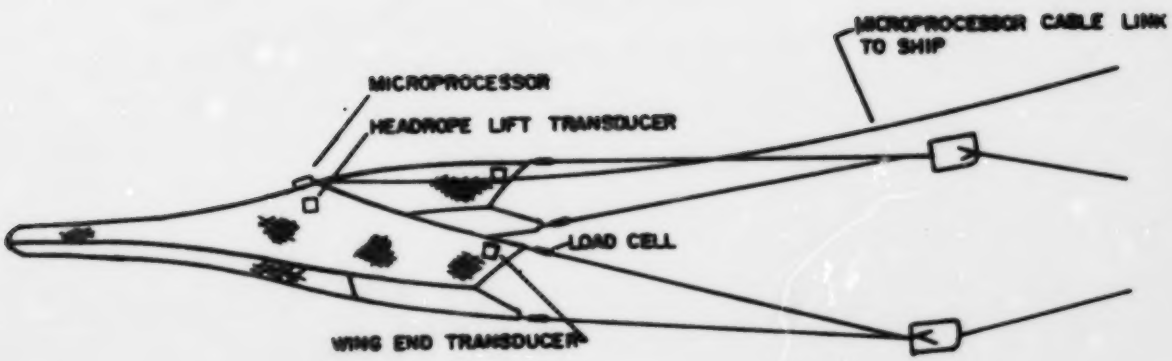

NOVEMBER 1981

DEVELOPMENT BRANCH REPORT NO. 25

Preliminary Report

on

Groundfish Trawl Experiments 1979-1981

by

David Hearn

Reginald Kingsley

Technology Division, Department of Fisheries
Government of Newfoundland and Labrador

Development Branch Report No. 25

ABSTRACT

This report covers recent development work carried out by the Fisheries Technology Division of the Provincial Department of Fisheries on otter trawls. It outlines comparative fishing trials along with trawl instrumentation tests and an evaluation of trawl designs. The investigations were carried out in the Fall of 1979 and continued until the spring of 1980 on the West Coast of the province.

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ACKNOWLEDGEMENTS

We would like to acknowledge the assistance of the Industrial Development Branch of the Federal Department of Fisheries and Oceans. The comparative fishing trials with the experimental trawls were carried out as a joint project between both Departments. We are indebted to them for the use of their trawl gear instrument set used in making the underwater measurements on the fishing gear.

A special word of thanks is due Captain Frank Earles, Project Officer, for his usual co-operation during the sea trials.

The skippers and crews of the fishing vessels Starcraft, Ocean Floor II, Robin and Gail, Straits Pride, Sea Trek and the Cape Bluff are also gratefully acknowledged for their co-operation and assistance.

We also extend a word of thanks to NORDCO Ltd. for their assistance in conducting the trawl instrumentation trials.

Introduction

The Inshore Trawl Fishery along the West coast of Newfoundland has steadily developed to a state where today it represents the most productive method for harvesting cod fish in this region. It is interesting to note that harvesting cod by this method developed as a by-catch from the inshore shrimp dragging operation. Eventually a more concentrated effort was put on harvesting cod during "reduced shrimp landing" periods. This practice reached such a level of production that it became the only method of fishing for many inshore draggers in the area although some owners still retained the advantage of a shrimp license.

The early trawls used in this fishery were basically groundfish trawls with shrimp webbing. When ground fishing increased in importance the mesh size in the shrimp trawl designs was increased to accommodate this new fishery.

The basic design for these nets, based on the Yankee 36 trawl, has been in existence for several years and they have proven to be very productive given the right bottom and fishing conditions. However, they fail to take into account the new rough bottom gear or the "high lift" characteristics that have been developed in recent years. In order to update the gear used in this fishery, the Fisheries Technology

Division of the Provincial Department of Fisheries carried out comparative fishing trials in the Strait of Belle Isle in August, 1979. Two new trawls were imported from Denmark and Germany and fished comparatively against the traditional Yankee 36 trawl, which was the net most commonly used in the area.

The imported trawls proved to be very successful, greatly exceeding the landings of the traditional Yankee 36. In order to get a better understanding of how they behave while fishing, various measurements such as bridle tensions, wing end spread and headline lift were made on the nets, using an instrumentation set obtained on loan from the Industrial Development Branch of the Department of Fisheries and Oceans.

Based on the instrumentation measurements and comparative fishing results, two trawls of different characteristics were developed by the Technology Division and tested during the winter fishery off Port aux Basques. One of these designs proved to be very successful and has been used extensively in the commercial fishery.

Comparative Fishing Trials

The comparative fishing trials were designed to test the imported nets against the Yankee 36 trawl under commercial fishing conditions. Two local trawlers of the same basic design and horsepower were contracted to carry out fishing operations. The trawlers fished in the same area at the same time and as close together as possible. The first trawl tested was the Iver Christensen star balloon net from Denmark. After five fishing days the difference in catch rate was such that further comparative fishing against the Yankee 36 was unnecessary. The German Engel trawl was then compared directly with the Iver Christensen net. The trawls were switched aboard each boat to accommodate any difference in the vessels or the skippers' fishing techniques.

The fishing trials clearly showed that both imported trawls were more productive than the Yankee 36. The Iver Christensen net is an excellent rough bottom trawl which was born out by the fact that this area is well known for its rough bottom conditions and in the 12 fishing days the net received no significant damage. The Engel trawl had excellent catching characteristics, but the plied nylon twine used in the construction and the foot gear made it impractical for fishing on rough bottom conditions.

Table I

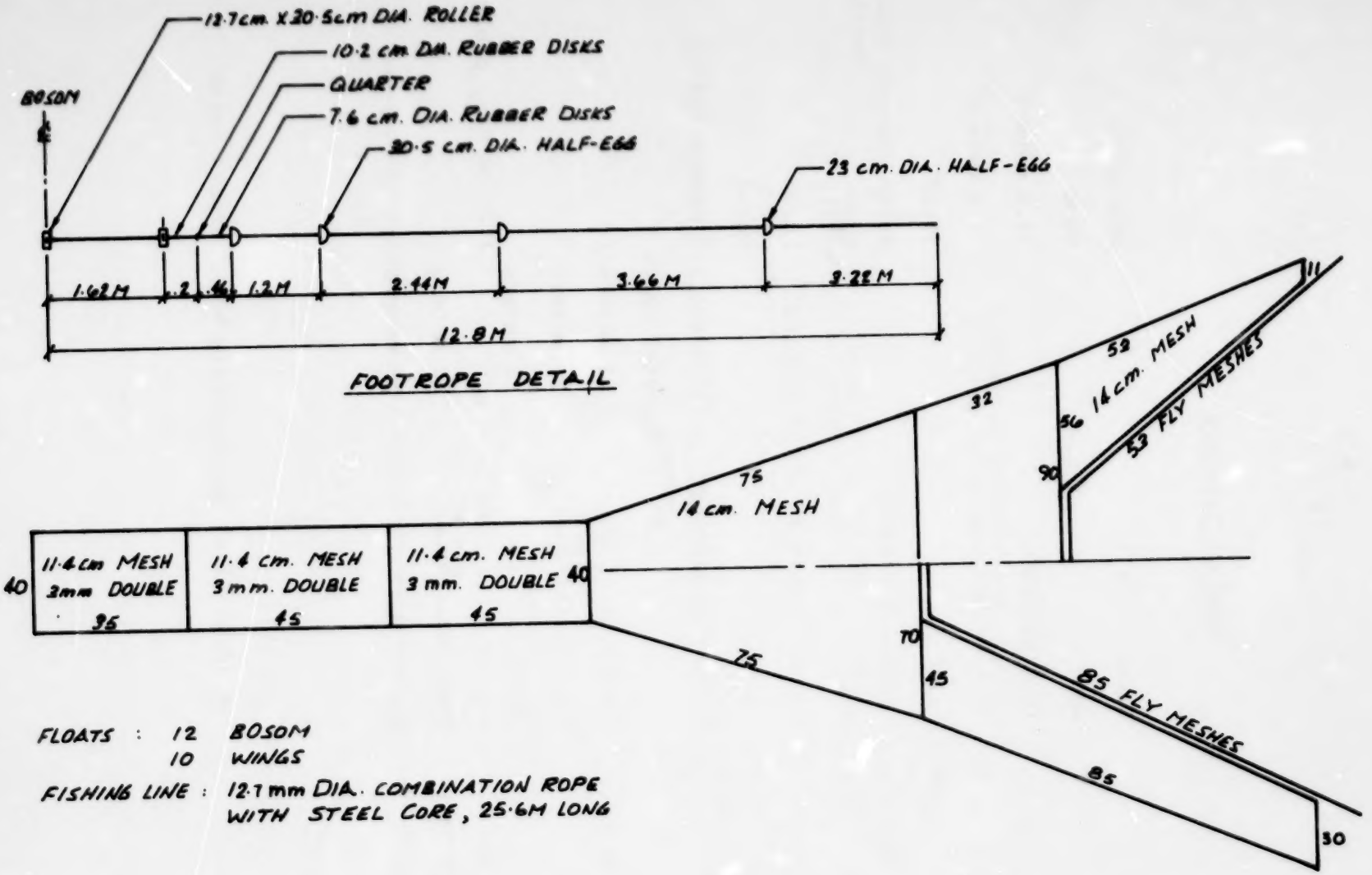
Summary of Comparative
Fishing Trial Results

Net	No. of days fished	Total No. of Tows	Total Fishing Time	Total Catch (kg)	Average Catch/ Tow	Catch/ Hour Towing
Yankee 36	5	28	30 hrs. 25 min.	22,222	793.64	730.58
I.C.	12	66	74 hrs. 40 min.	127,204	1927.33	1703.62
Engel	7	28	24 hrs. 55 min.	59,332	2119.00	2381.21

Note: Pages 27-74 will provide daily results.

Project Trawlers

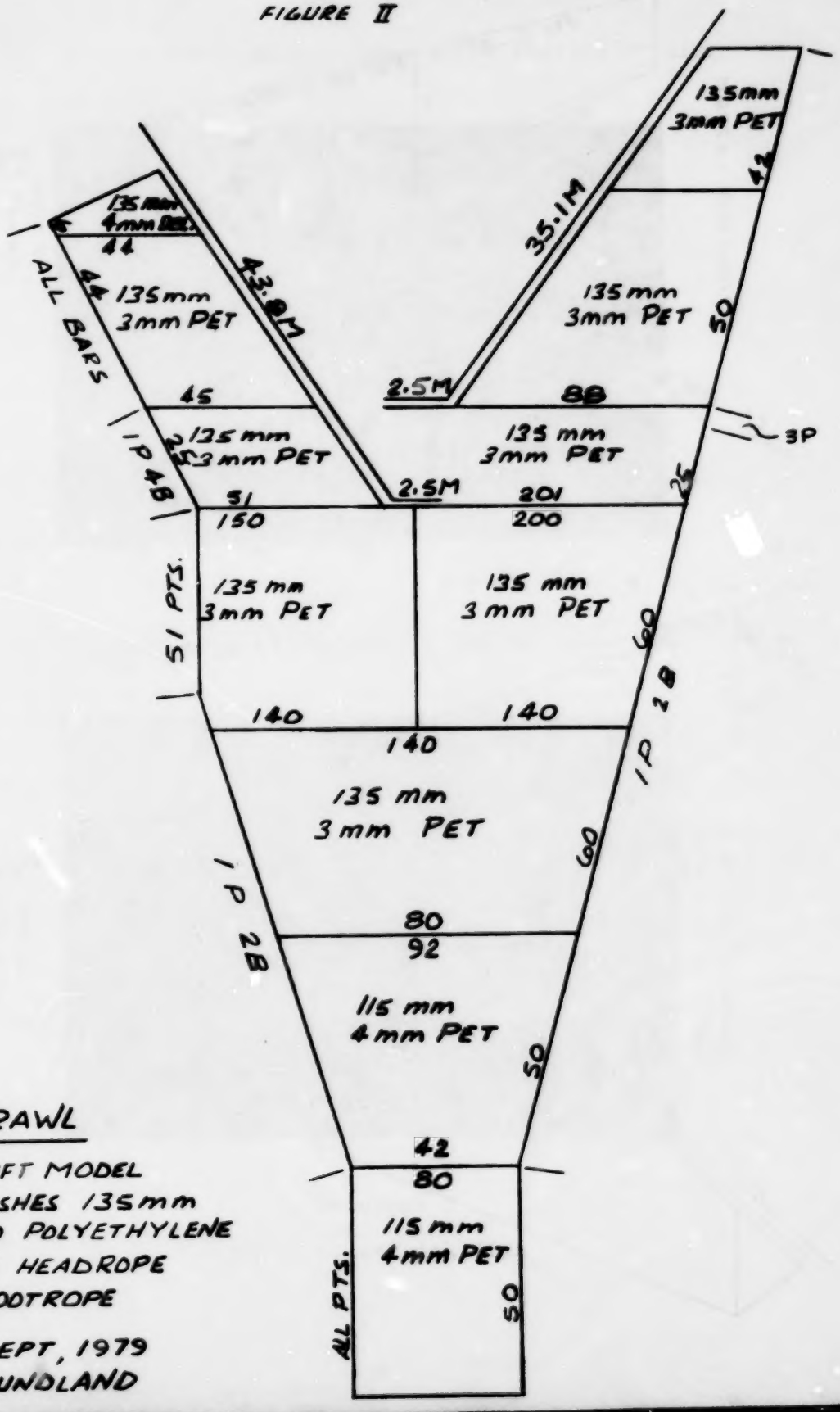
Name:	Ocean Floor II		Starcraft
Hull:	Wood		Wood
LOA:	16.8 meters		16.8 meters
Beam:	5.4 meters		5.1 meters
Gross Tonnage:	52.56		49.42
Engine:	Penta A/B Diesel		Turbo Charged Diesel Peoria
B.H.P.:	324		360
Sounder:	Furno - (gain #5 while fishing)		Furno
Radar:	Furno		Furno
Doors:	Rectangular Wooden	2.3 meters 1.3 meters 454 kg.	
Warp:	1.27 cm diameter cable		
Bridles:	Yankee 36	27 meters	
	Iver Christensen	55 meters	
	Engel	55 meters	1.27 cm dia. cable
Ground Warp:	Iver Christensen	55 meters	
	Engel	55 meters	



YANKEE 36

FIGURE 1

FIGURE II

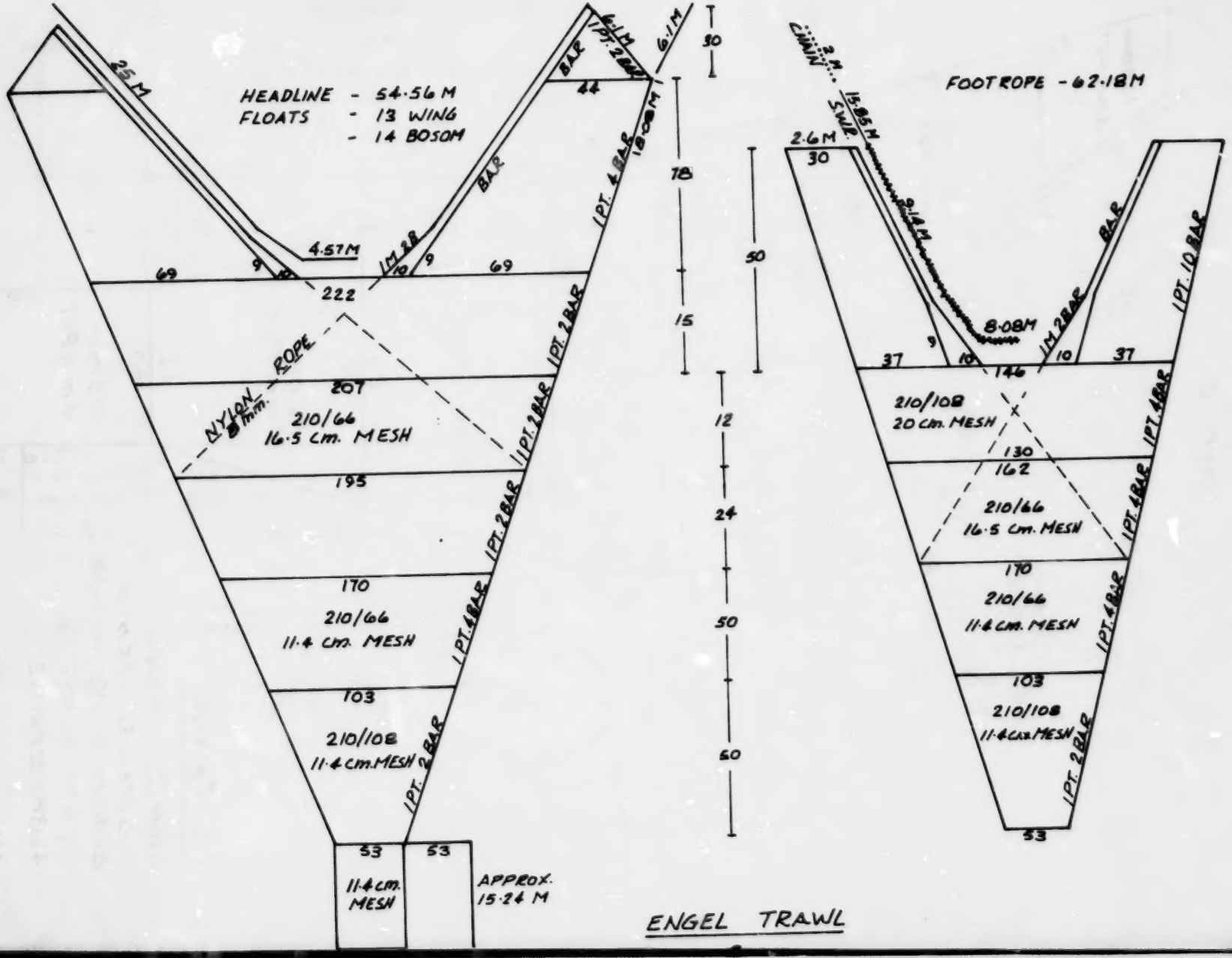


I.C. TRAWL

HIGH LIFT MODEL
350 MESHES 135mm
BRAIDED POLYETHYLENE
37.6M HEADROPE
46.3M FOOTROPE

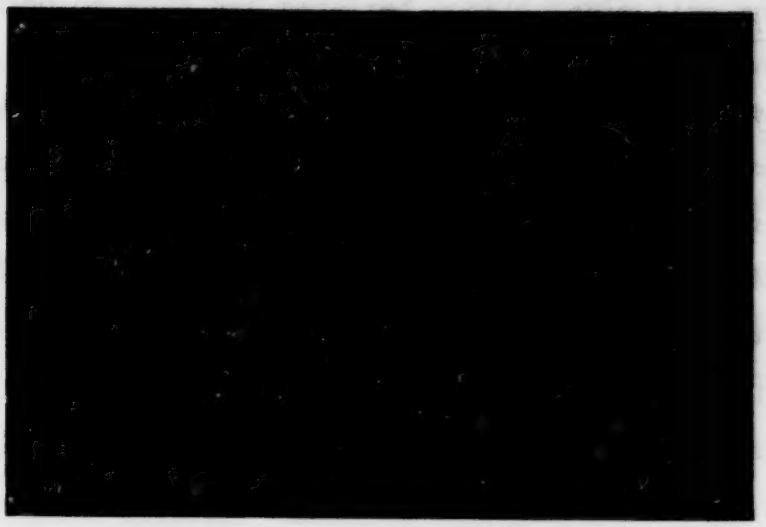
AUG, SEPT, 1979
NEWFOUNDLAND

FIGURE III



ENGEL TRAWL

Photographs taken during comparative fishing trials:



Photograph 1

Cod end with approx. 12,000 lb catch

Photograph 2

Decks flush with fish

Trawl Instrumentation

The results of the comparative fishing trials indicated that the European nets had excellent fishing characteristics. In order to get some indication as to the general features which determine successful net designs, we made a series of comparative measurements using an instrumentation set obtained from I.D.B. of Federal Fisheries. These measurements on the nets used in the fishing trials consisted of bridle tensions, wing end spread and centre headline lift and warp tensions at ship end. The Straits Pride, a 17.6 m trawler towed the nets while the measurements were being recorded.

The instrumentation system is based on a cable hook-up from the various sensors mounted on the net to a micro processor attached to the head rope and to the control display console installed on the bridge of the project vessel. The warp tensions at ship end were measured by attaching an Enerpac load cell to the warps and recording the loads for each net being measured.

Basically, this system requires rigging each net with the various sensors and cables, towing the net to make the required measurements and then transferring the equipment to another net to repeat the measurements. While we did succeed in obtaining satisfactory measurements, the rigging

and unrigging of each net required considerable time and care. There is an important need for development of more portable equipment, possibly "self recording" for measuring trawl paramters.

The measurements indicate that the new trawls have much larger spread and lift characteristics which contribute to their fishing performance. In general, they have a large fishing area in the front of the net.

Table II

Summary of Trawl Instrumentation Measurements

Type of Trawl	R.P.M.	Average Tension in Starboard Bridles (Kg)			Average Tension in Port Bridles (Kg)			Average Head Line Height (Meters)	Average Wing Spread (Meters)	Average Warp Tension (Kg)	
		Top	Center	Bottom	Top	Center	Bottom			Starboard	Port
I.C.	1500	388		75	370		159	4.6	14.7	908	908
	1600	437		98	393		153	4.4	14.4	999	999
	1700	623		155	522		183	4.5	14.2	1226	1226
Yankee 36	1450	187		184	148		192	2.9	11.5	862	862
	1500	218		223	223		277	2.5	11	908	908
	1600	193		237	199		281	2.9	10.4	908	908
Engel	1500	252	122	100	228	246	56	6.4	21.3	908	908
	1600	294	171	138	264	286	94	5.8	20.4	999	999
	1700	303	207	142	280	312	83	5.9	19.5	1021	1021

Note: Pages 75-82 will provide data sheets.

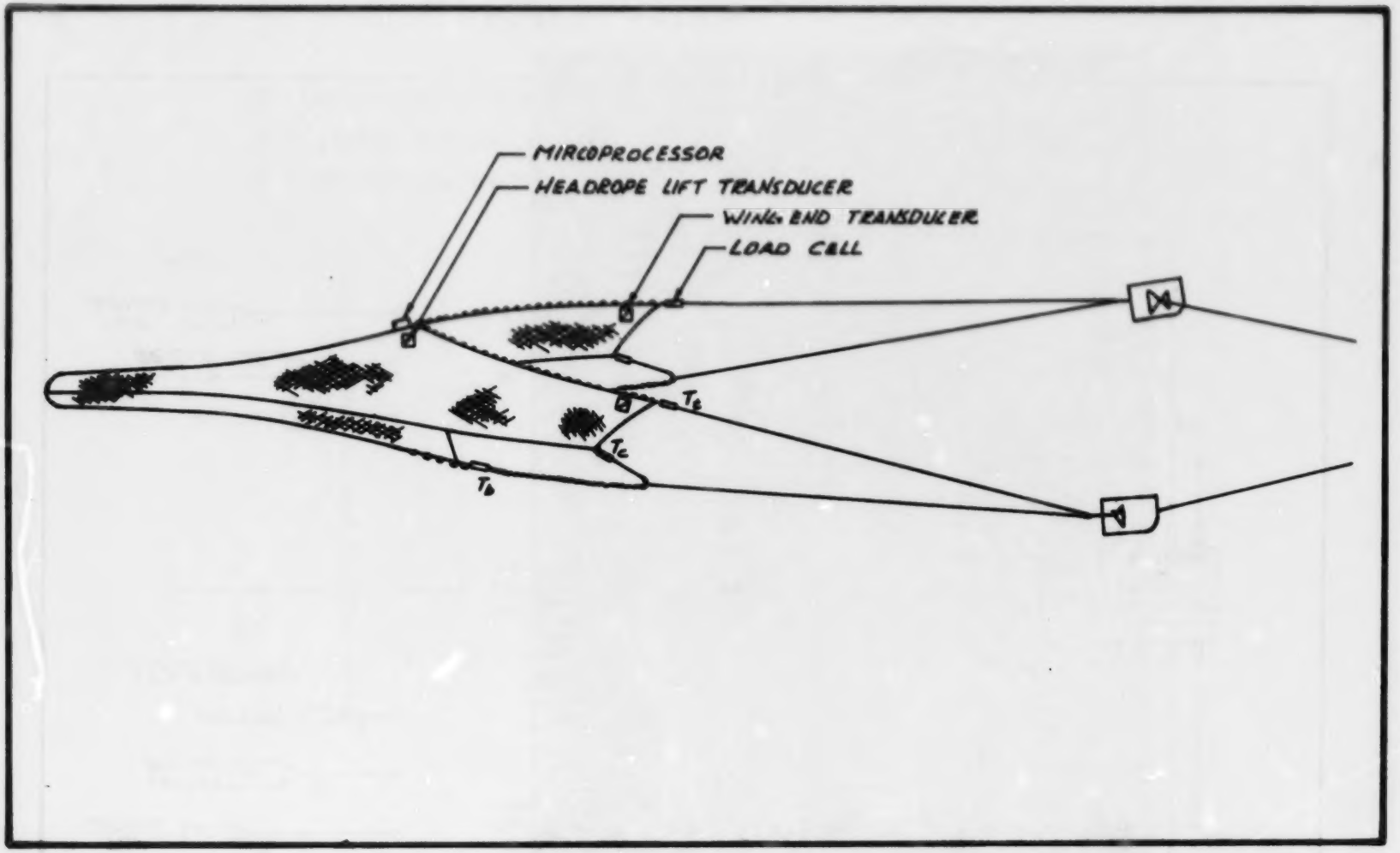
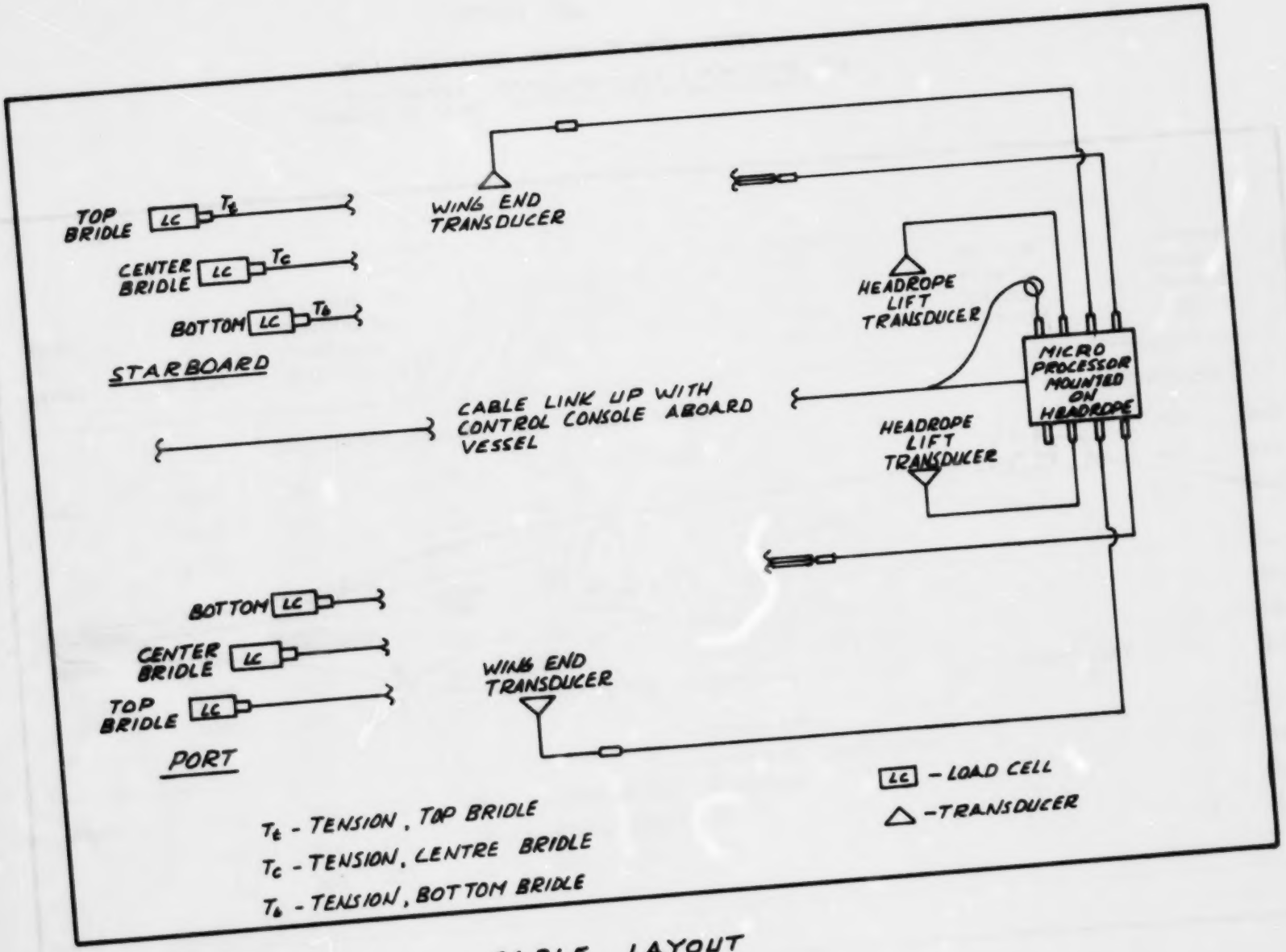


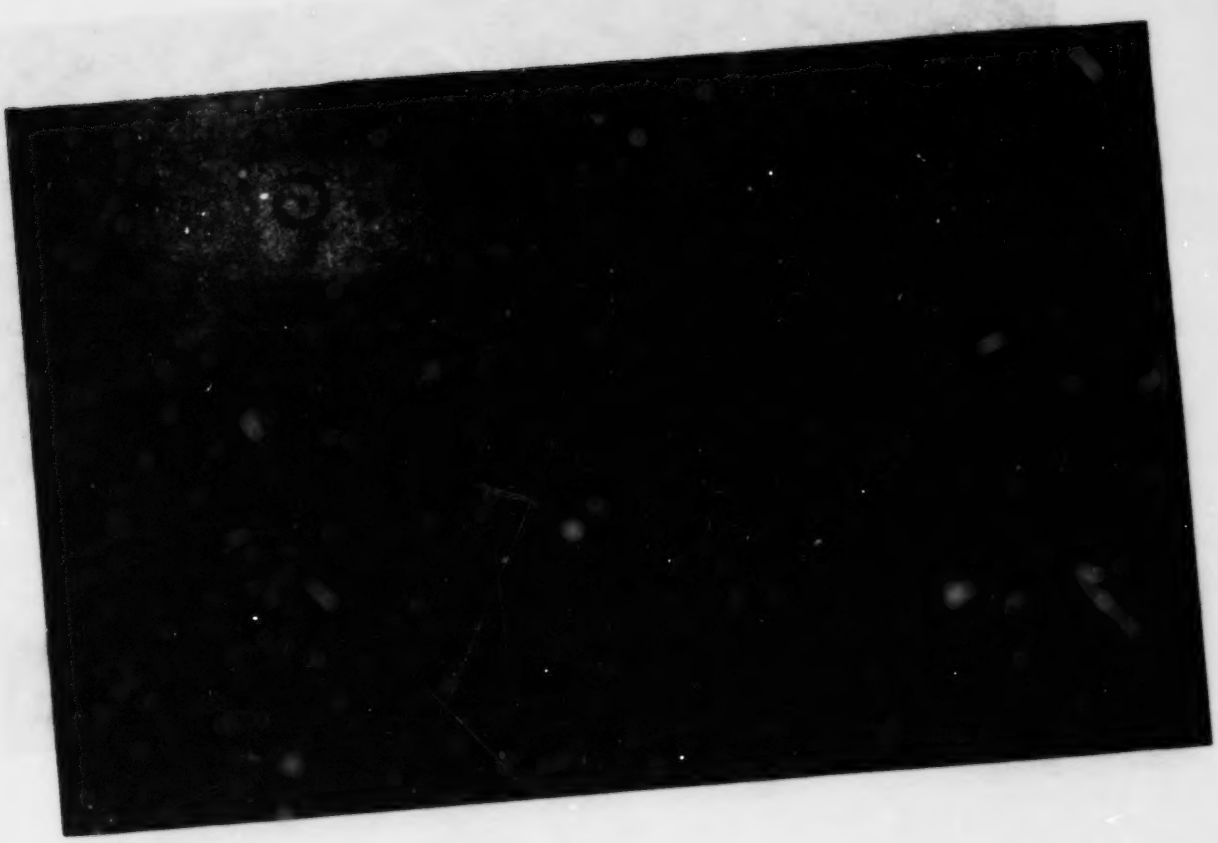
DIAGRAM ILLUSTRATING LOCATIONS OF
NET SENSORS AND LOAD CELLS

FIGURE IV



CABLE LAYOUT

FIGURE V



Photograph 3

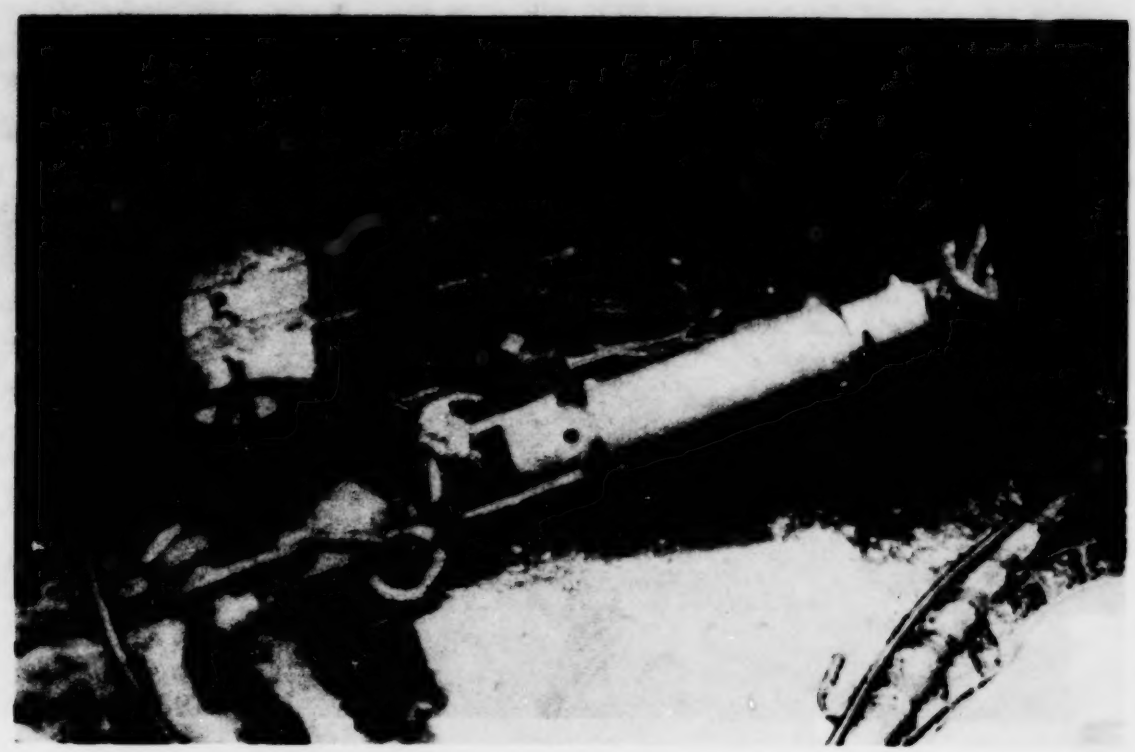
Central Console and Display Unit

Photograph 4

Head Rope Micro Processor

Photograph 5

Wing End Transducer



Photograph 6

Bridle Load Cell

Fishing Trials

Following the instrumentation phase, two trawls were constructed locally to the European designs with certain modifications. In particular, significant changes were made to the Engel trawl to render it more suitable for local conditions.

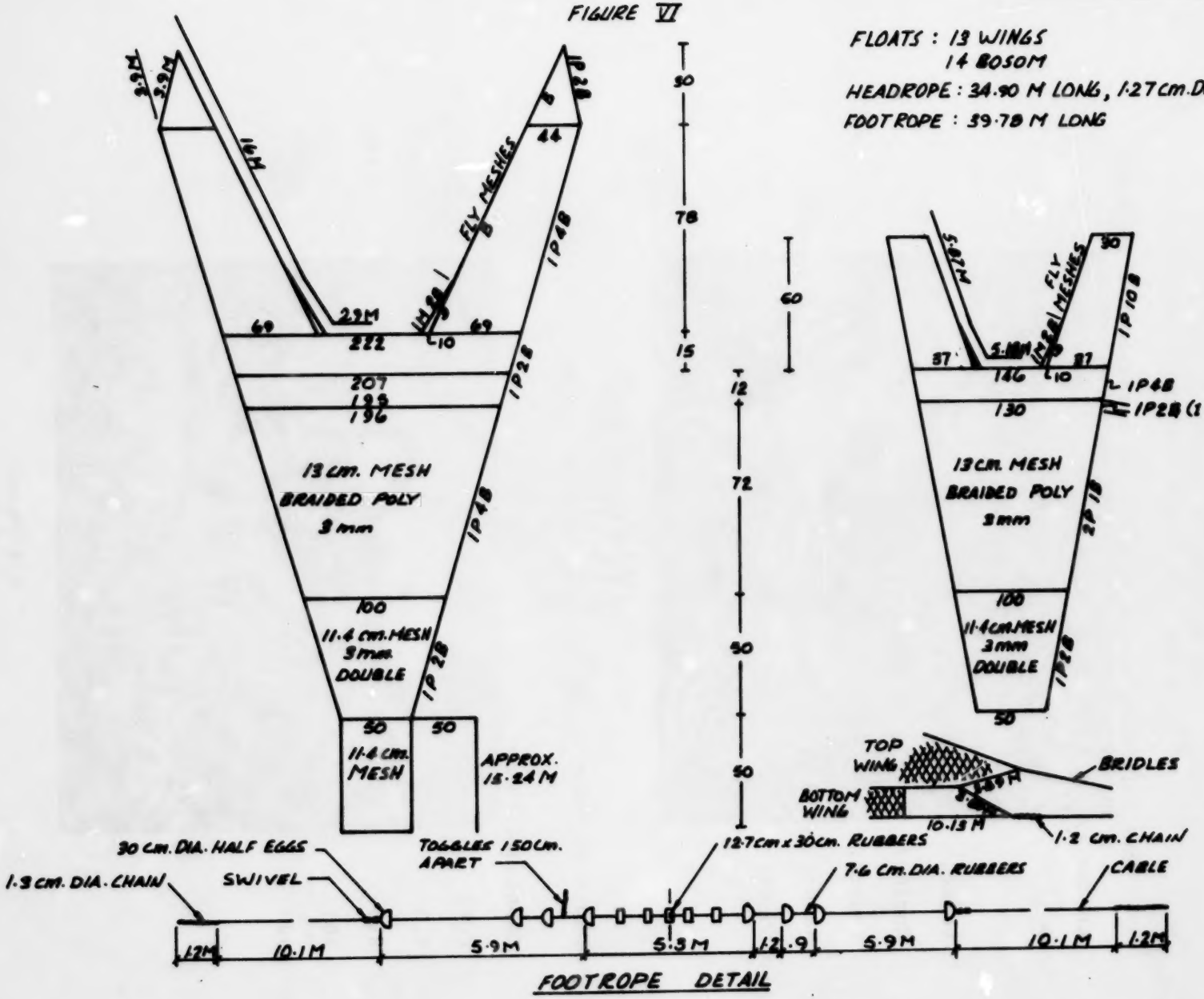
Of these two nets, the one made to the I.C. design was badly damaged before any conclusive results were obtained. The modified Engel (Codroy) trawl, however, was fished for the entire season with good results and accepted as a commercially successful gear.

Table III

Landings for the
Robin and Gail
Using Re-Designed
Engel (Codroy) Trawl

Date		(cod) Catch (Kgs)
March 8, 1980		14,515
March 10, 1980		27,216
March 14, 1980		7,258
March 18, 1980		7,800
March 20, 1980		37,843
March 21, 1980		34,474
March 23, 1980		19,505
	Total	148,611

FIGURE VI



FOOTROPE DETAIL

REDESIGNED ENGEL TRAWL (CODROY)

The following are ship end load measurements recorded on the re-designed Engel Trawl using an Enerpac LTM5 Load Cell.

Vessel:	Cape Bluff	
Engine:	365 hp Cat	
Length:	17.6 m	
Warp:	1.27 cm diameter	Length 500 meters
Doors:	Rectangular Wooden	
	Length: 2.3 m	
	Width: 1.3 m	
	Weight: 453 kg	
Depth of Water:	150 m	

Tensions: (Kg)

Port	Starboard	R.P.M.
816	839	1350
816	907	1375
907	997	1500
997	1088	1500

Photographs taken during fishing trials with the re-designed Engel (Codroy) Trawl aboard the Robin and Gail - March, 1980

Photograph 7

Cod-end coming to the surface

Photograph 8

Net being hauled aboard boat

Photograph 9

Lifting cod-end aboard Robin & Gail

Photograph 10

Dumping cod-end on deck

Photograph 11

Getting cod-end ready for another lift

Photograph 12

Fish on deck ready to go below

Conclusion

The striking difference in catch rates obtained during the comparative fishing trials demonstrated the superiority of the experimental trawls. The entire fleet was immediately interested in obtaining new trawls and, through sales efforts made by a number of local suppliers, the following fishing season of 1980 saw the commercial use of a variety of new gears of various sizes, some of which were constructed to the designs contained in this report while others were different. Primarily, however, it is fair to say that the I.C. trawl was the most extensively used gear during the summer of 1980 and as of now it is most certainly the most extensively used trawl in the inshore fleet. Indeed, largely as a result of this project the parent Danish company established a new firm in Newfoundland known as I.C. Trawls International Limited, with a facility at Stephenville. These trawls are now made at that location for Newfoundland as well as other Atlantic province requirements.

The higher catches taken with these trawls is attributed primarily to the higher lift and wider spread of the net mouth, although there were significant differences in cable lengths associated with the bridles and ground warps (i.e. ground cables, sweeps). The data of Appendix II shows that at

a towing speed of 3.0 knots the average headline lift and wing spread of the I.C. trawl was approximately 4.7 meters and 14.7 meters, respectively. This compares with 2.8 meters and 11.4 meters in the case of the Yankee 36 trawl. Thus, both lift and spread were significantly greater. As for the ground cables, subsequent commercial use of the gears has been very successful while using bridles only, with no ground cables. This facilitates its use on rough bottom and it is interesting to note that vessels are now towing in areas that were previously unexploited due to unfavourable bottom conditions.

The modified Engel (Codroy) trawl specified in this report has proven to be equally effective on the fishing grounds. It has not, however, been extensively used by the fleet because it is not readily available from commercial suppliers.

Appendix I

Comparative Fishing Trials

Daily Records

Vessel Name STARCRAFT Captain's Name Winston Genge

Trawl Yankee 36 Date August 15, 1979

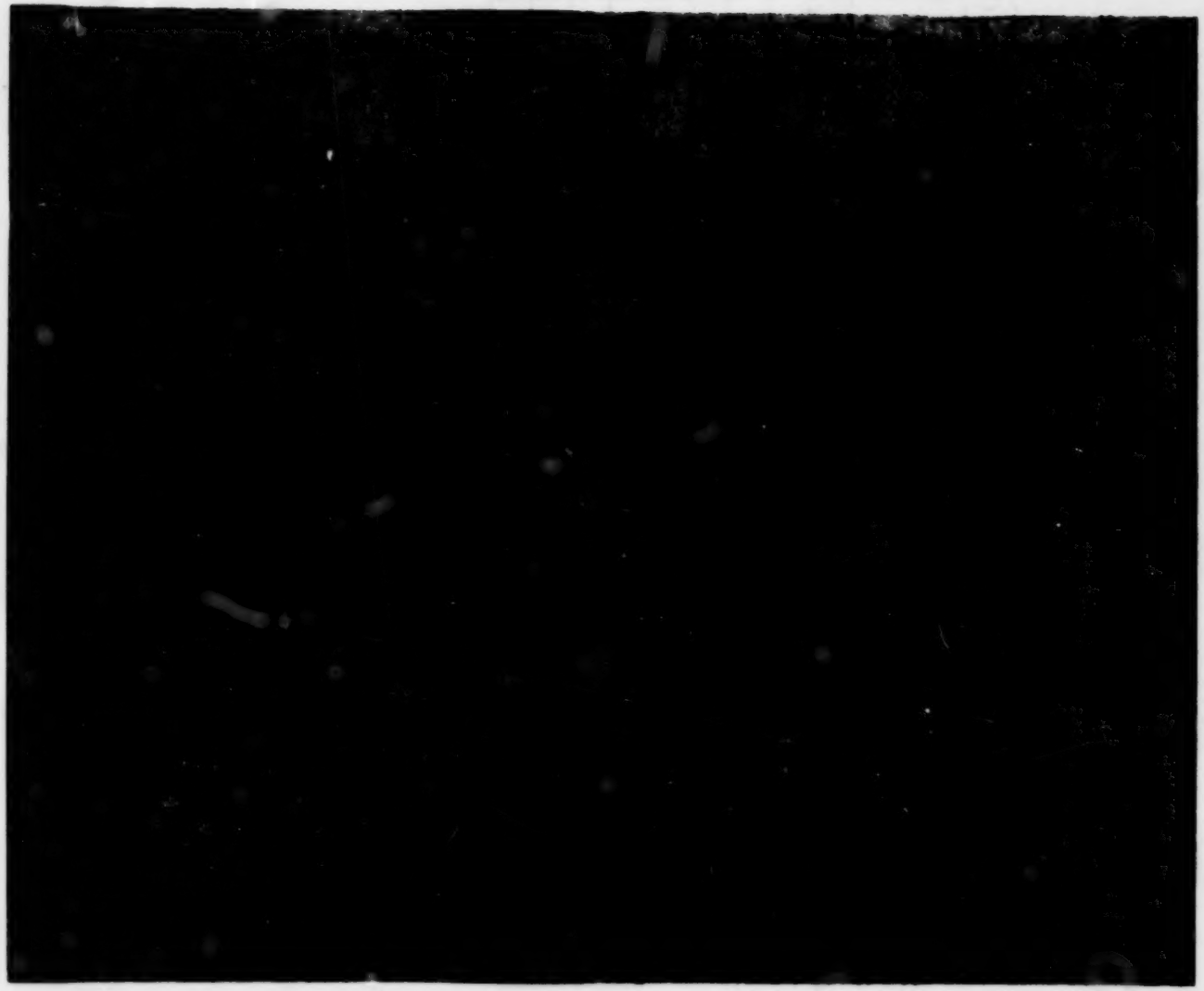
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	70	274	E to ESE	1400	0935	1020	680	
2	64	274	E to ESE	1400	1115	1145	680	
3	73	274	E to ESE	1425	1230	1435	1361	
4	78	274	SE	1450	1450	1515	227	
5	58	274	WSW	1425	1605	1610		
6								
7								
8								
9								

Location	Latitude	Longitude
Start	51° 25' N	56° 55' W
Finish	51° 26' N	56° 46' W

Total Catch (Actual Weight) (Kg) 2948

Total Fishing Time 3 hrs. 50 min.

Remarks: This trawl was constructed by the Technology Division. The captain requested that he be permitted to fish his own model of the Yankee 36. It is the same net design but with slight variations in the foot gear.



Trawl Yankee 36 Vessel Starcraft Date Aug.15 Tow No. 3 Catch 1361 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Gange

Trawl Iver Christensen Date August 15, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	73	274	E to ESE	1610	0930	1010	1134	
2	55	274	WSW	1650	1100	1115	1134	
3	73	274	ESE	1610	1205	1410	454	
4	78	274	WSW	1700	1435	1635	1814	
5	58	274	WSW	1600	1715	1745	4082	
6	67	274	ESE to NE	1600	1815	1900	2722	
7	58	274	WSW	1600	1930	2005	1814	

Location	Latitude	Longitude
Start	51° 25' N	56° 55' W
Finish	51° 26' N	56° 46' W

Total Catch (Actual Weight) (Kg) 13, 381

Total Fishing Time 6 hr 50 Min

Remarks: Combination bottom bridles wearing badly on rough bottom.

Trawl I.C. Vessel Ocean Floor II Date AUG. 15 Tow No. 5 Catch 4082 kg cod

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Yankee 36 Date August 16, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	67	274	NE to E	1400	1130	1230	227	
2	55	274	W	1400	1310	1330	1134	
3	76	274	W	1400	1345	1445	227	
4	71	274	W	1400	1500	1610	136	

Location	Latitude	Longitude
Start	51° 15' N	56° 56' W
Finish		

Total Catch (Actual Weight) (Kg) 1587

Total Fishing Time 3 hr 30 Min

Remarks: Captain fishing his own 36 Trawl today.

Trawl Yankee 36 Vessel Starcraft Date Aug.16 Tow No. 2 Catch 1134 kg cod

Vessel Name Ocean Floor Captain's Name Chesley Genge

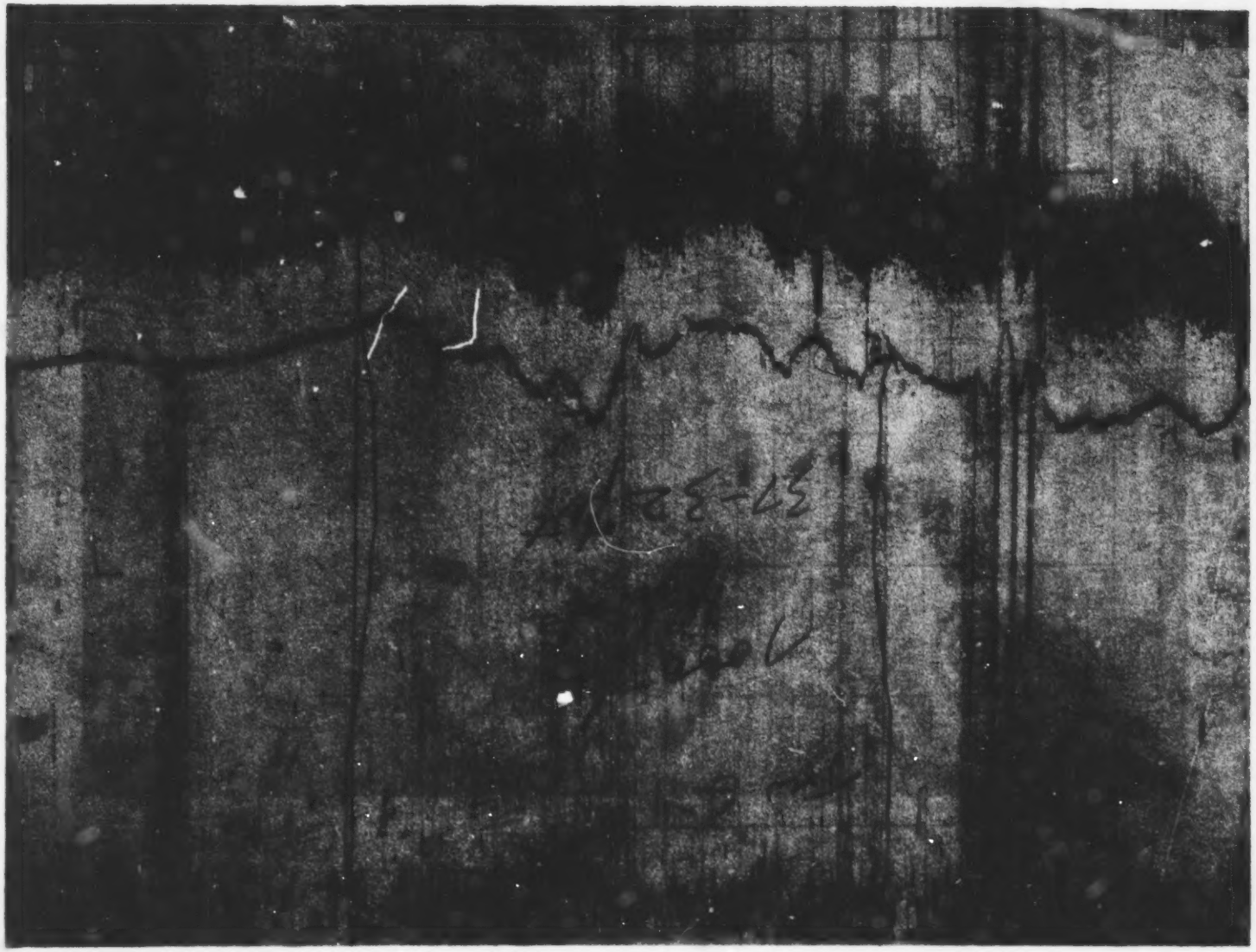
Trawl Iver Christensen Date August 16, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	80	274	ESE	1600	1050	1220	680	
2	69	274	WSW	1600	1305	1345	3175	
3	60	274	W to WSW	1600	1450	1550	136	
4	62	274	SW to WSW	1600	1730	1750	45	

Location	Latitude	Longitude
Start	51° 15' N	56° 56' W
Finish		

Total Catch (Actual Weight) (Kg) 4142 Total Fishing Time 3 hr 30 Min

Remarks: Strong SW winds, picking up a lot of seaweed and jelly fish



Trawl I.C. Vessel Ocean Floor II Date AUG. 16 Tow No. 2 Catch 3175 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Iver Christensen Date August 17, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	30	150	ESE	1600	0836	0920	3629	454
2	28	150	WSW x SW	1600	1000	1130		
3	28	150	ESE	1600	1210	1340		
4	34	150	WSW	1700	1415	1555		
5	34	150	ESE	1600	1615	1810		
6	32	150	SW x W	1600	1835	1925	91	272

Location	Latitude	Longitude
Start	51 27'	56 26'
Finish	51 31'	56 19'

Total Catch (Actual Weight) (Kg) 12,949

Total Fishing Time 8 hr 10 Min

Remarks: Picking up significant amount of flounder. Bottom bridles gone, necessary to replace combination with 1.27 cm cable.

Trawl I.C. Vessel Ocean Floor II Date AUG. 17 Tow No. 1 Catch 3629 kg cod, 454 kg flounder

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Yankee 36 Date August 17, 1979

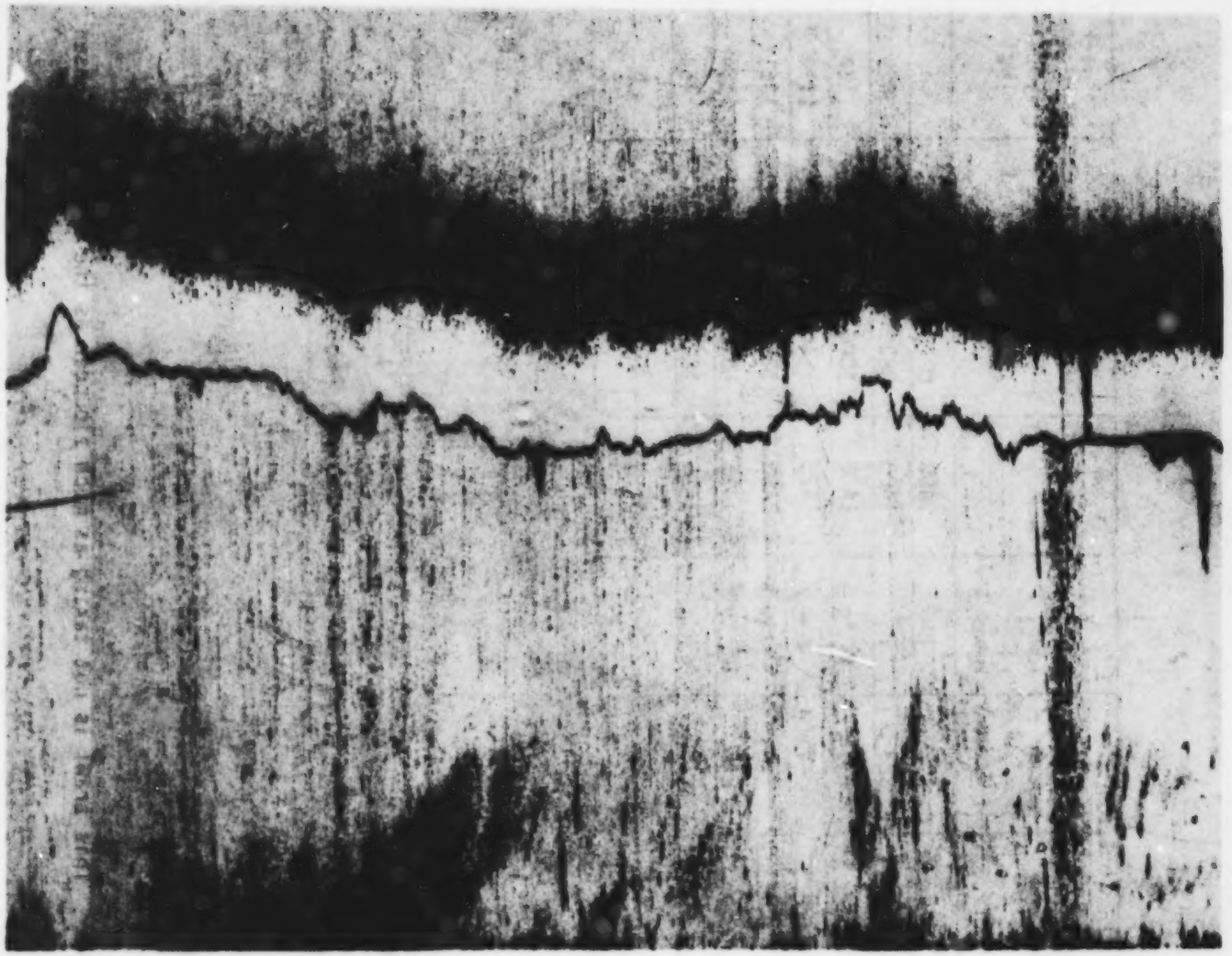
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	49	182	E	1400	0720	0740		
2	54	228	E	1400	0830	0930	3629	
3	45	228	SW to W	1400	1000	1115	1134	
4	58	228	NE to E	1425	1140	1330	1134	
5	64	274	SW to W	1450	1350	1550	1361	
6	56	274	NE to E	1425	1610	1750	1134	
7	60	228	N	1425	1825	1930	454	

Location	Latitude	Longitude
Start	51° 27' N	56° 26' W
Finish	51° 31' N	56° 19' W

Total Catch (Actual Weight) (Kg) 8613

Total Fishing Time 9 hr 10 Min

Remarks: This trawl is not taking as much flounder as the Iver Christensen



Trawl Yankee 36 Vessel Starcraft Date Aug.17 Tow No. 5 Catch 1361 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Yankee 36 Date August 20, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	64	274	E to ENE	1600	0715	0845	136	136
2	62	274	ESE	1700	0910	1110	1598	
3	65	182	WSW	1700	1130	1200	227	
4	64	320	ESE	1700	1315	1425	1814	
5	60	274	WSW	1700	1455	1700	136	100
6	58	274	E to ESE	1700	1730	1930		

Location	Latitude	Longitude
Start	51° 31' N	56° 19' W
Finish		

Total Catch (Actual Weight) (Kg) 5464

Total Fishing Time 8 hr 15 Min

Remarks:

Trawl Yankee 36 Vessel Ocean Floor II Date AUG. 20 Tow No. 4 Catch 1814 kg cod

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Iver Christensen Date August 20, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	54	228	NE to E	1425	0655	0840	1134	
2	64	228	NE to E	1400	0910	1120	6804	
3	64	228	SW to W	1500	1145	1245	2722	
4	58	228	NE to E	1500	1330	1430	907	
5	54	228	SW to W	1500	1520	1720	1134	

Location	Latitude	Longitude
Start	51° 31' N	56° 19' W
Finish		

Total Catch (Actual Weight) (Kg) 12,428

Total Fishing Time 7 hr 55 Min

Remarks: Picked up a lot of squid on several tows today

Trawl I.C. Vessel Starcraft Date Aug. 20 Tow No. 2 Catch 6804 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Yankee 36 Date August 21, 1979

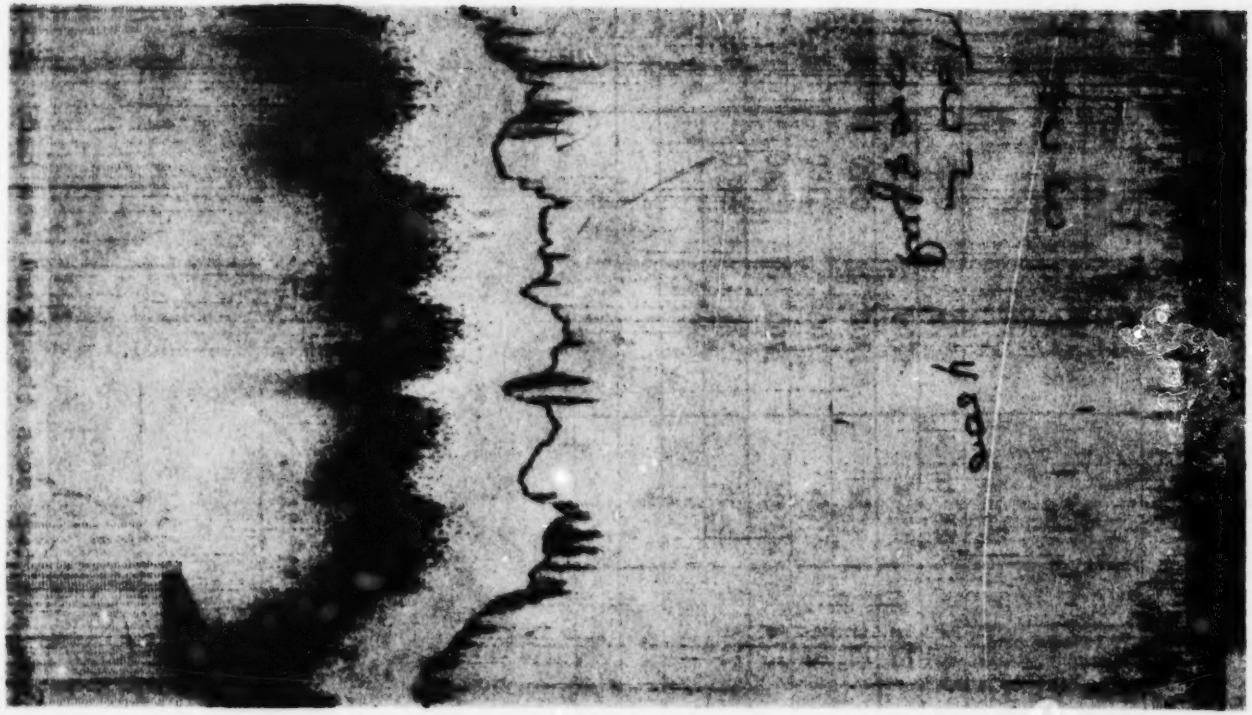
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	73	274	SW to SE	1700	0635	0730	1361	
2	78	274	W	1700	0755	0855	1814	
3	76	274	SE	1700	0920	1040	136	
4	60	274	SW	1700	1150	1220	454	
5	73	274	SW	1700	1240	1420	136	
6	64	274	SE	1675	1550	1615		

Location	Latitude	Longitude
Start	51° 21' N	57° 03' W
Finish	51° 24' N	56° 54' W

Total Catch (Actual Weight) (Kg) 3605

Total Fishing Time 5 hr 40 Min

Remarks: In the last two sets the trawl was badly torn.



Trawl Yankee 36 Vessel Ocean Floor II Date AUG. 21 Tow No. 2 Catch 1814 kg cod

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Iver Christensen Date August 21, 1980

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	64	228	E to SE	1450	0640	0750	5443	
2	58	228	E to SE	1500	0900	1030	4536	
3	54	228	W to NW	1500	1125	1225	1361	
4	64	228	E to SE	1500	1300	1415	1270	
5	62	228	E to SE	1500	1455	1540	6350	

Location	Latitude	Longitude
Start	51° 21' N	57° 03' W
Finish	51° 24' N	56° 54' W

Total Catch (Actual Weight) (Kg) 20,684

Total Fishing Time 5 hr 40 Min

Remarks: Several of the boats fishing in the same area are having their nets badly torn on the rough bottom whereas the I.C. has not had any significant damage.

Trawl I.C. Vessel Starcraft Date Aug. 21 Tow No. 5 Catch 6350 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Engel Date August 22, 1979

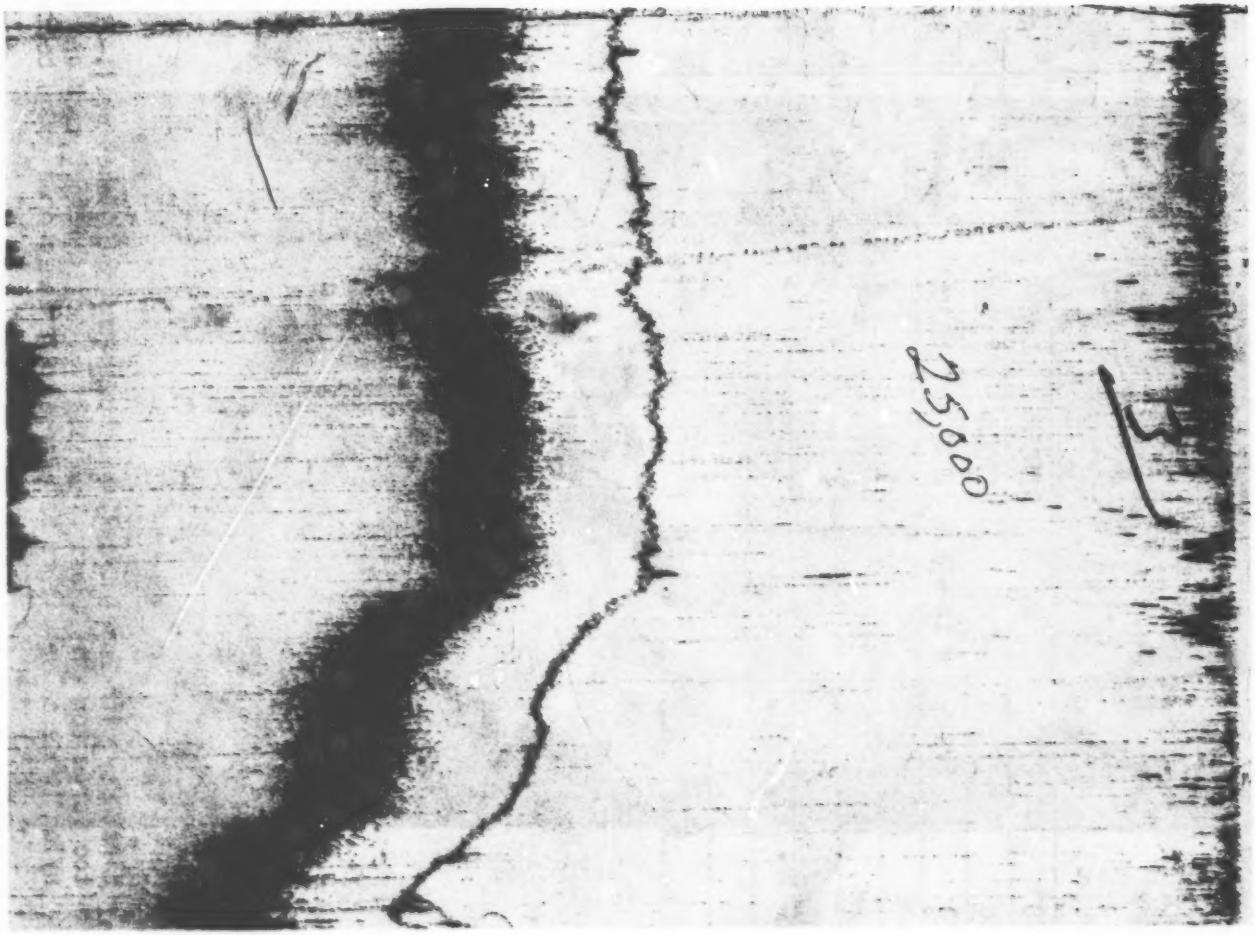
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	78	274	W	1700	1045	1105	6804	
2	58	274	Sw	1700	1250	1305	680	
3	80	274	W to WSW	1700	1340	1440	9072	

Location	Latitude	Longitude
Start	51° 26' N	59° 49' W
Finish	51° 27' N	56° 45 W

Total Catch (Actual Weight) (Kg) 19,150

Total Fishing Time 1 hr 35 Min

Remarks: First day with Engel trawl. Although the net fishes well, it is too large for this class of vessel. Also, the foot gear and the nylon twine causes it to be excessively damaged on rough bottom



Trawl Engel Vessel Ocean Floor II Date AUG. 22 Tow No. 3 Catch 9072 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

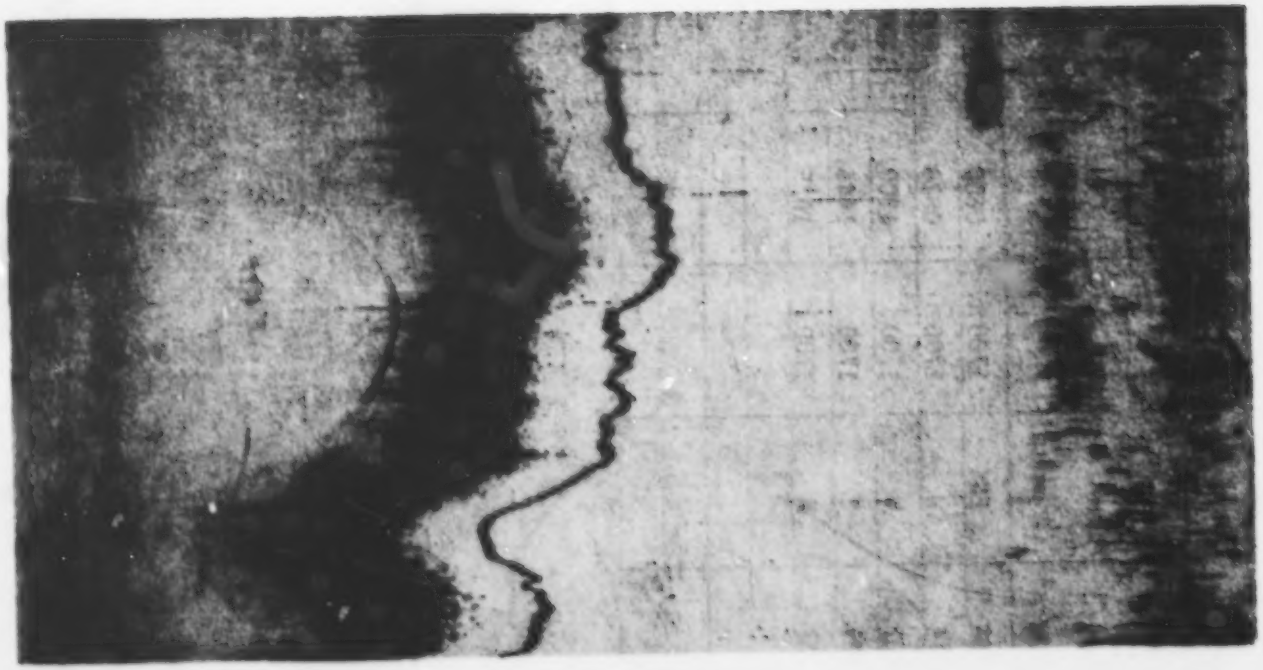
Trawl Engel Date August 24, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	65	182	ENE	1700	0600	0655	902	
2	71	274	SW	1700	0820	0900	1134	
3	40	182	W	1700	1300	1400	1361	680
4	47	137	E	1700	1445	1545	227	1134
5	40	137	W	1700	1615	1745	680	907

Location	Latitude	Longitude
Start	51° 30' N	56° 20' W
Finish	51° 32' N	56° 15' W

Total Catch (Actual Weight) (Kg) 9979 Total Fishing Time 5 hr 5 Min

Remarks: Time lost due to cleaning the trawl from bottom debris after every tow.



Trawl Engel Vessel Ocean Floor II Date AUG. 24 Tow No. 3 Catch 1361 kg cod, 680kg Flounder

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Iver Christensen Date August 22, 1979

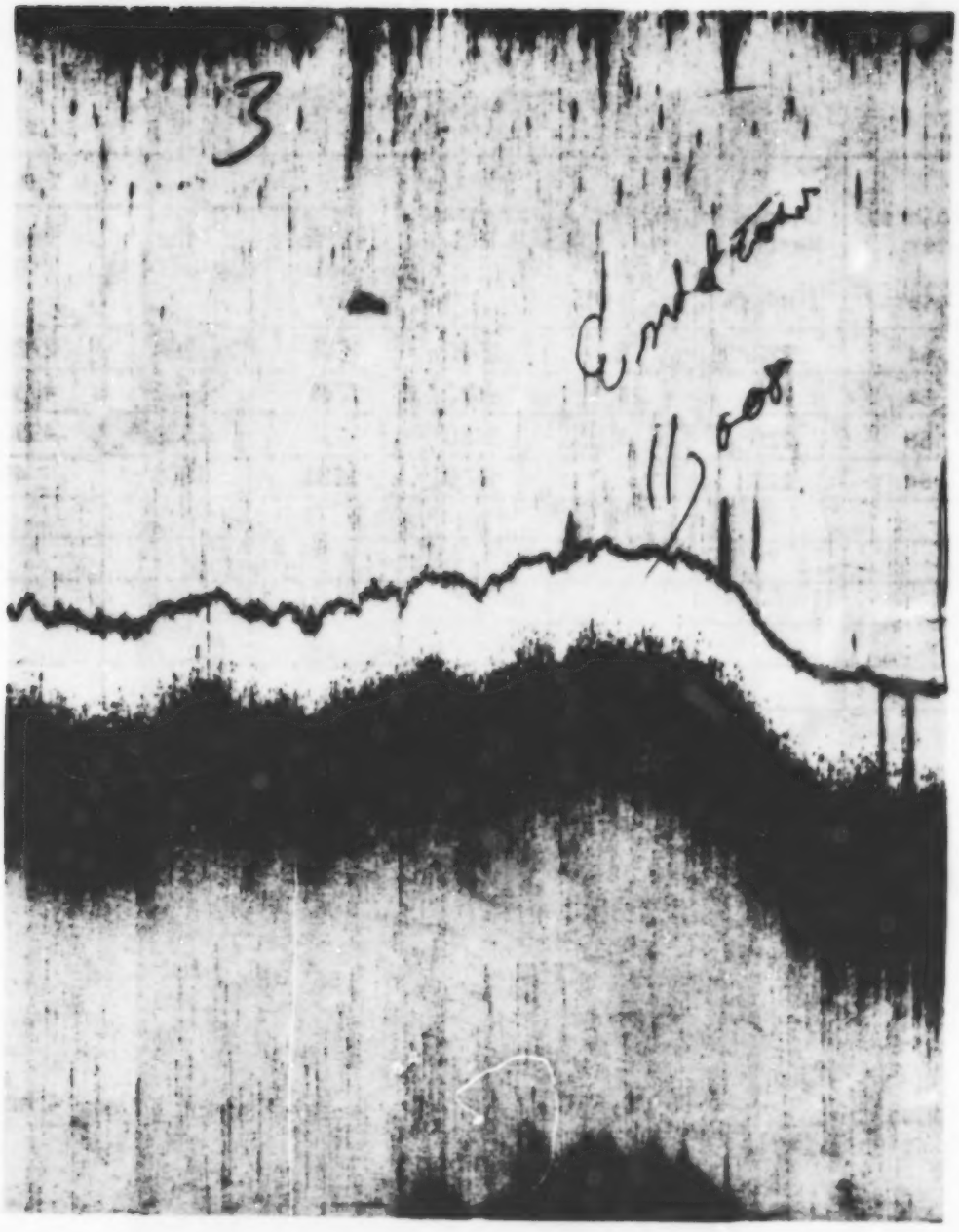
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	64	228	E	1500	1035	1200	2722	
2	54	228	W	1500	1245	1320	4536	
3	58	228	W	1450	1415	1530	4990	
4	64	228	E	1500	1620	1800	45	

Location	Latitude	Longitude
Start	51° 26'N	56° 49 W
Finish	51° 27' N	56° 45' W

Total Catch (Actual Weight) (Kg) 11,566

Total Fishing Time 4 hr 55 Min

Remarks:



Trawl I.C. Vessel Starcraft Date Aug.22 Tow No. 3 Catch 4990 kg cod

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Iver Christensen Date August 24, 1979

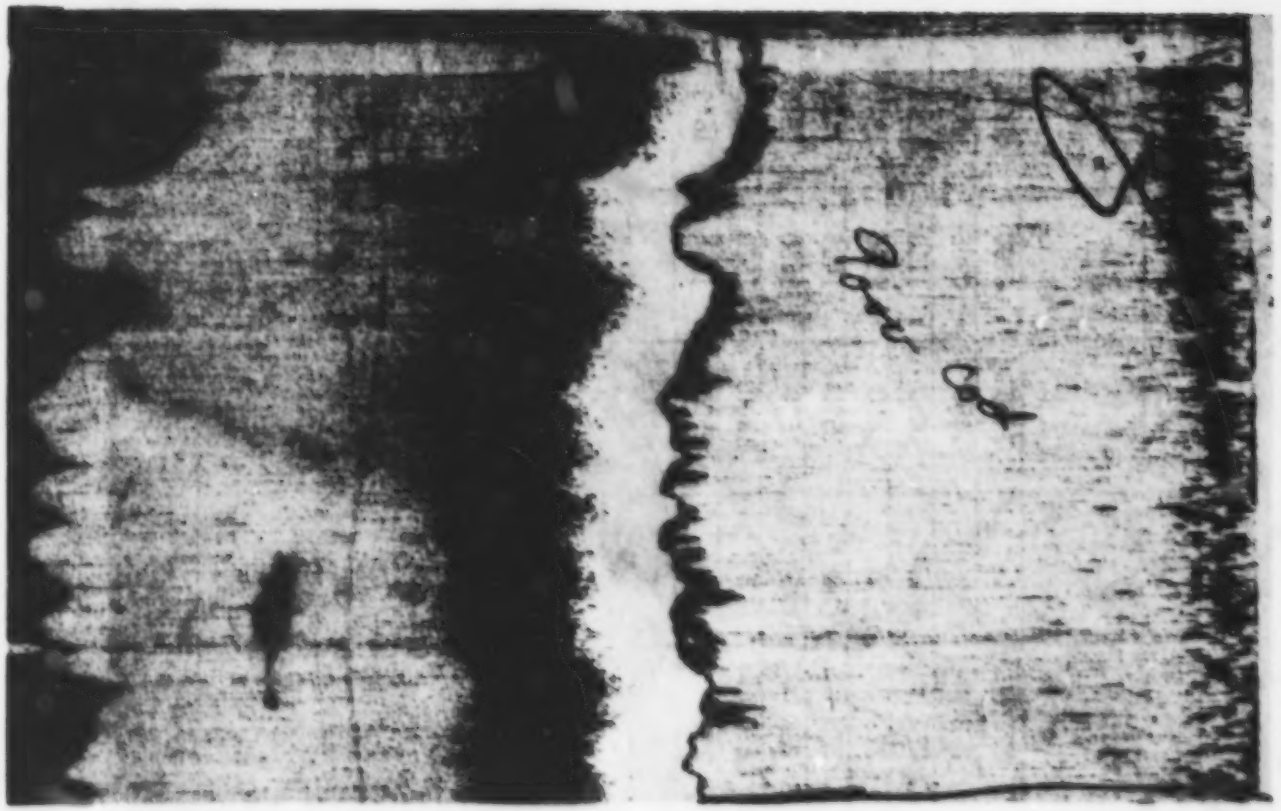
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	60	228	E	1450	0700	0800	1361	
2	58	228	W	1450	0905	1000	3402	
3	58	228	W	1450	1110	1205	1134	
4	73	228	W	1450	1300	1340	680	
5	91	228	W	1500	1405	1425	1814	
6	58	228	E	1500	1450	1545	1588	
7	58	228	E	1500	1620	1655	2177	
8	58	228	E	1500	1755	1840	4082	

Location	Latitude	Longitude
Start	51° 30' N	56° 20' W
Finish	51° 32' N	56° 15' W

Total Catch (Actual Weight) (Kg) 15,422

Total Fishing Time 6 hr 5 Min

Remarks:



Trawl I.C. Vessel Starcraft Date Aug.24 Tow No. 8 Catch 4082 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Engel Date August 25, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	67	274	SW	1700	0720	0730	680	
2	67	274	SW	1700	0755	0845	771	
3	51	274	WSW	1700	1025	1045	227	

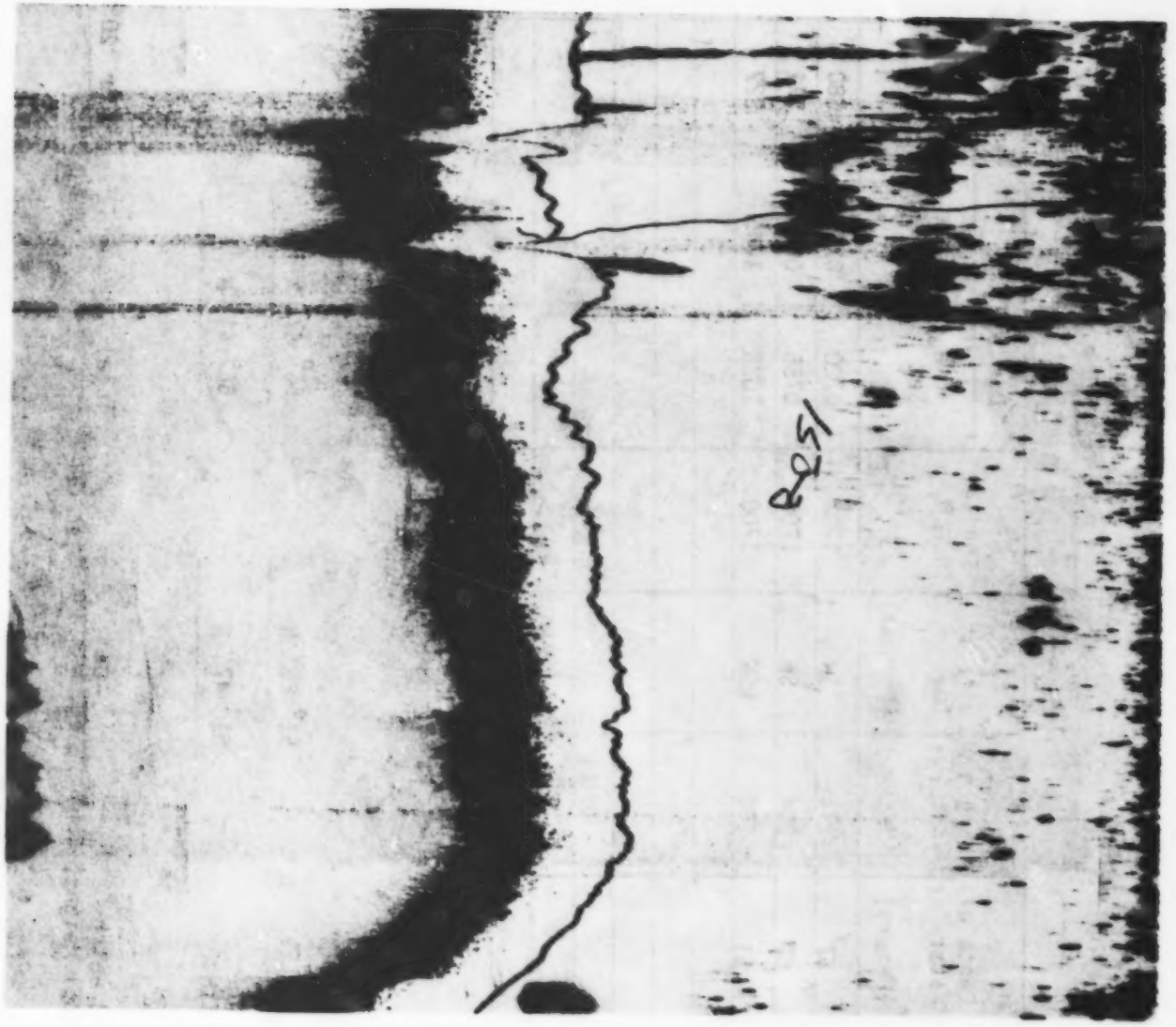
Location

	Latitude	Longitude
Start	51° 26' N	56° 47' W
Finish	51° 47' N	56° 41' W

Total Catch (Actual Weight) (Kg) 1406

Total Fishing Time 1 hr 20 Min

Remarks:



Trawl Engel Vessel Ocean Floor II Date AUG. 25 Tow No. 2 Catch 771 kg. cod

Vessel Name Starcraft

Captain's Name Winston Genge

Trawl Iver Christensen

Date August 25, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	64	228	W	1450	0720	0815	1814	
2	54	228	W	1450	1010	1135	1134	
3	64	228	W	1450	1245	1330	1134	
4	40	228	W	1450	1415	1450	1814	

Location	Latitude	Longitude
Start	51° 26' N	56° 47' W
Finish	51° 29'N	56° 41' W

Total Catch (Actual Weight) (Kg) 6395

Total Fishing Time 3 hr 40 Min

Remarks:

Trawl I.C. Vessel Starcraft Date Aug. 25 Tow No. 1 Catch 1814 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Engel Date August 27, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	69	228	W	1700	0820	0930	907	
2	36	137	W	1700	0950	1130	1134	
3	36	137	W	1700			1361	
4	36	137	E	1700			1588	
5	36	137	W	1700			1588	

Location Latitude Longitude

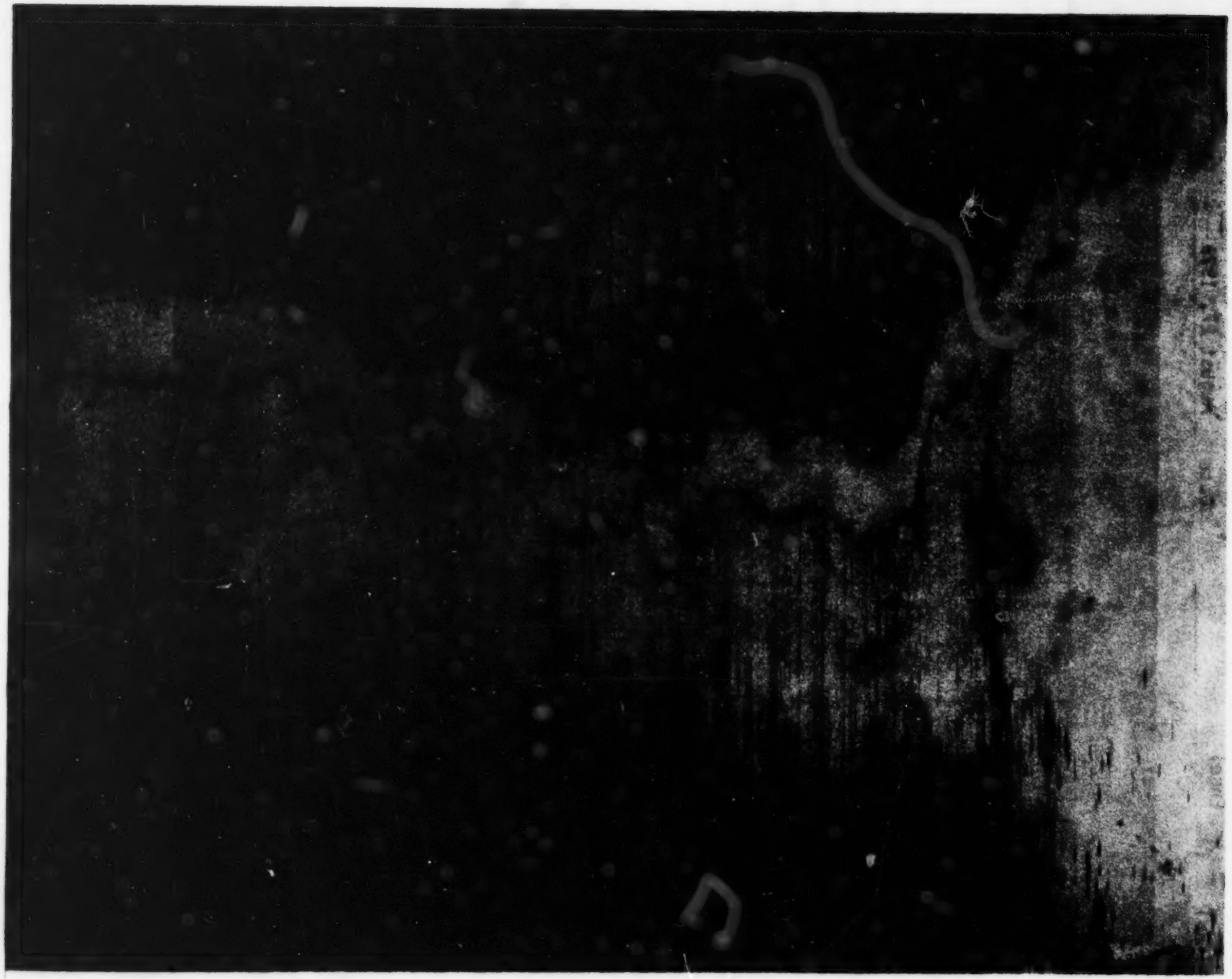
Start 51° 24' N 56° 15' W

Finish 51° 28' N 56° 23' W

Total Catch (Actual Weight) (Kg) 6577

Total Fishing Time 2 hr 50 Min

Remarks:



Trawl Engel Vessel Ocean Floor II Date AUG. 27 Tow No. 2 Catch 1134 lbs cod

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Iver Christensen Date August 27 1979

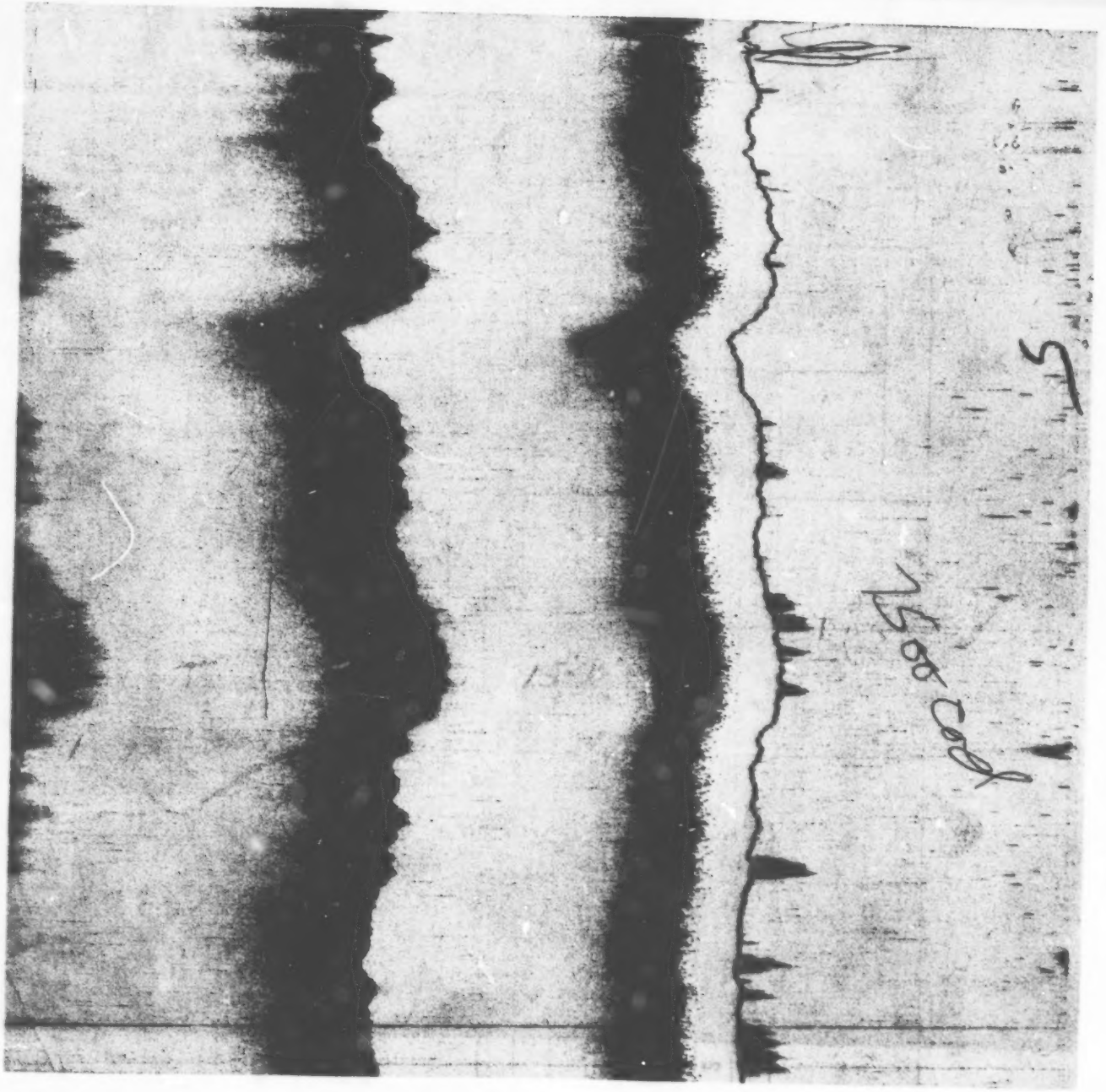
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	69	228	W	1450	0825	0915	1134	
2	36	228	W	1450	0945	1105	1361	
3	36	228	W	1450	1305	1430	1361	
4	36	228	W	1450	1505	1620	1134	
5	36	137	W	1450	1650	1815	3402	

Location	Latitude	Longitude
Start	51° 24' N	56° 15' W
Finish	51° 28' W	56° 23' W

Total Catch (Actual Weight) (Kg) 7756

Total Fishing Time 6 hr 15 Min

Remarks:



Trawl I.C. Vessel Starcraft Date Aug. 27 Tow No. 5 Catch 3402 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Iver Christensen Date August 28, 1979

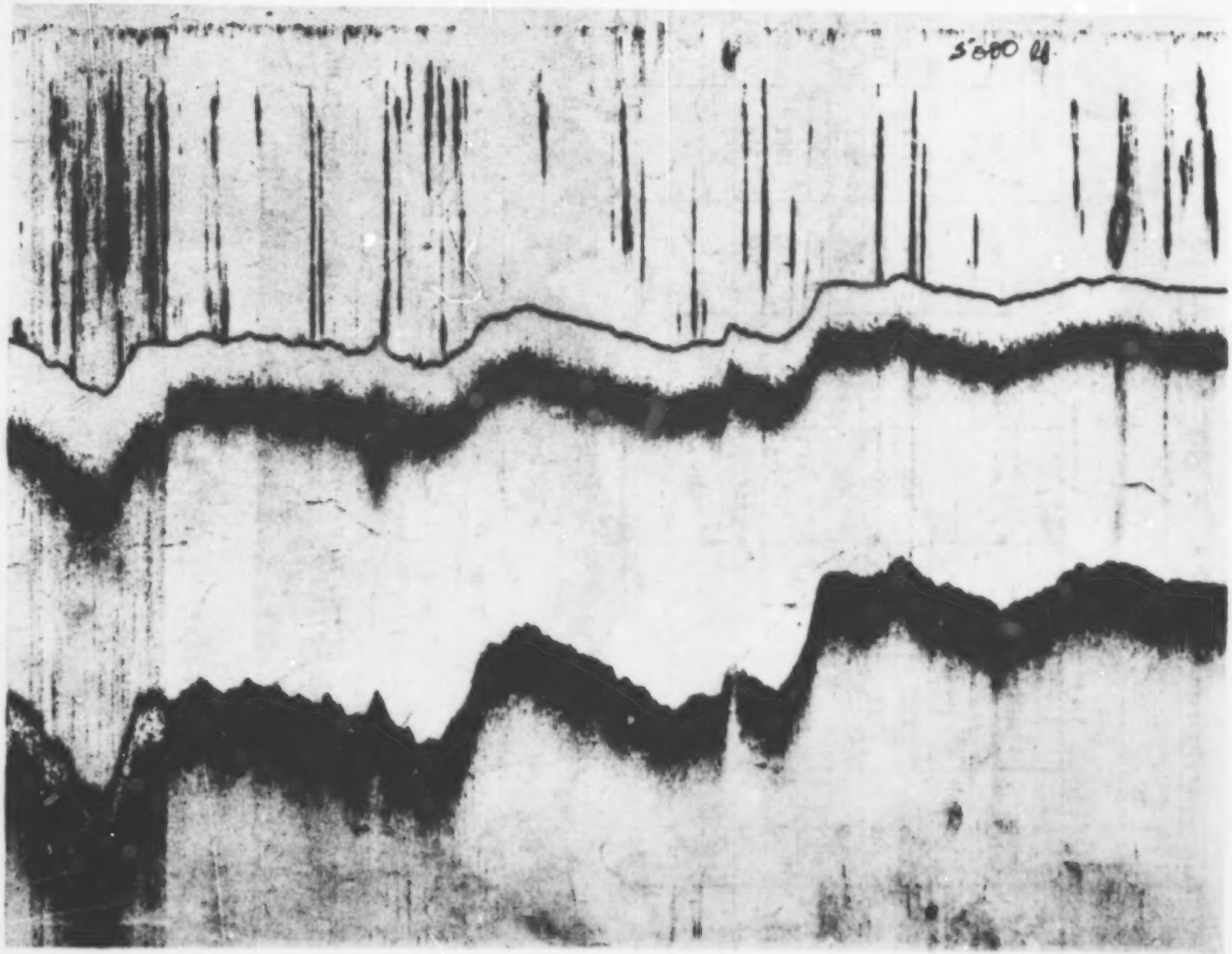
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	85	274		1700	0800	0910	771	
2	44	182		1700	1100	1230	680	1588
3	42	137		1700	1300	1500	454	227
4	45	182		1625	1520	1705	1361	454
5	43	182		1700	1735	1850	1361	227
6	43	182		1700	1910	1955	318	363

Location	Latitude	Longitude
Start	51° 29' N	56° 15' W
Finish	51° 28' N	56° 23' W

Total Catch (Actual Weight) (Kg) - 8126

Total Fishing Time 8 hr 25 Min

Remarks:



Trawl I.C. Vessel Ocean Floor II Date AUG. 28 Tow No. 2 Catch 680 kg cod, 1588 kg flounder

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Engel Date August 28, 1979

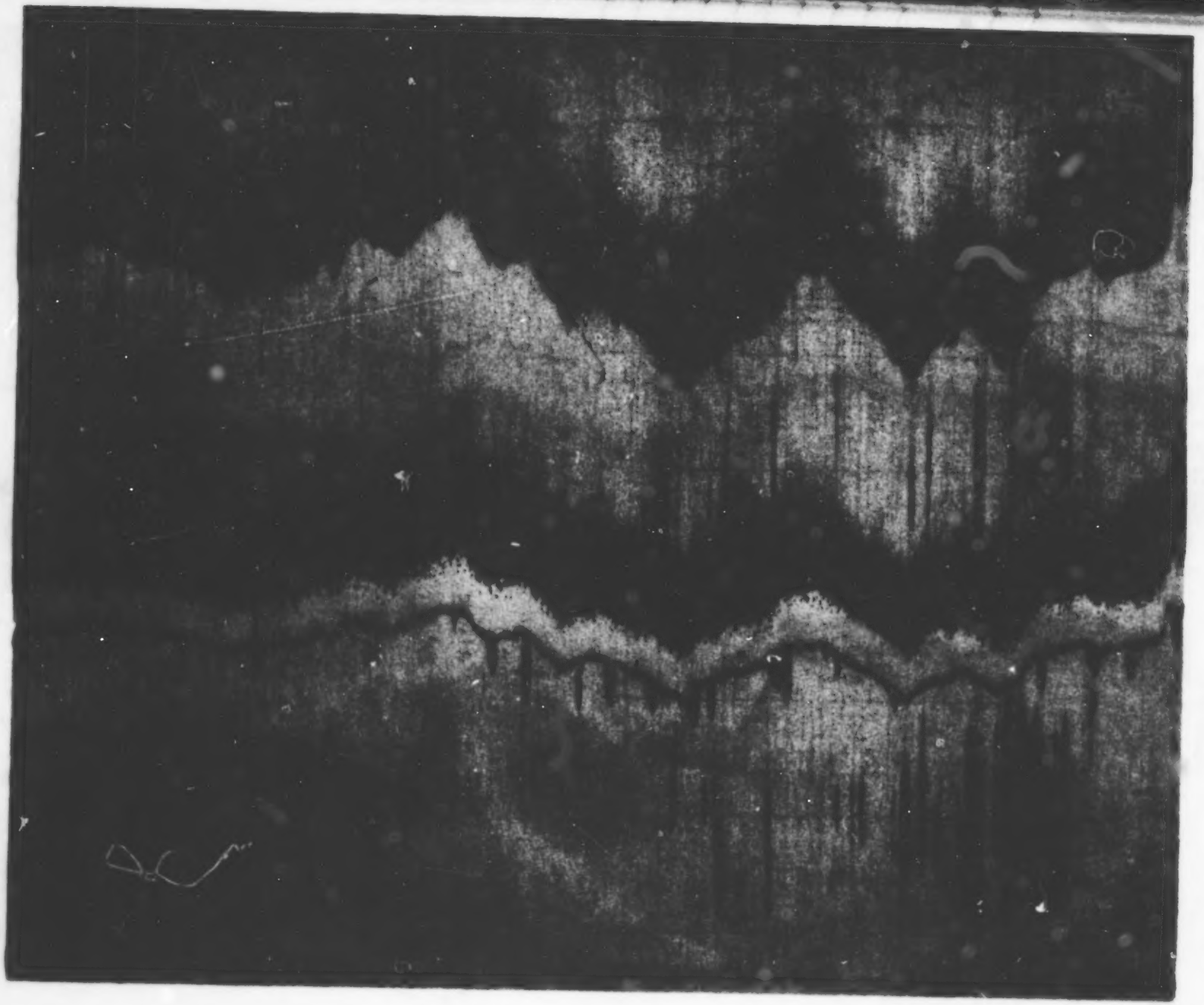
Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	82	228	E	1500	0810	0910	907	
2	36	137	E	1500	1110	1230	227	
3	36	137	W	1500	1315	1430	907	
4	36	137	E	1500	1525	1725	1814	
5	40	182	W	1500	1755	1905	3175	

Location	Latitude	Longitude
Start	51° 29' N	56° 15' W
Finish	51° 28' N	56° 23' W

Total Catch (Actual Weight) (Kg) 9525

Total Fishing Time 6 hr 45 Min

Remarks:



Trawl Engel Vessel Starcraft Date Aug. 28 Tow No. 4 Catch 1814 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Iver Christensen Date August 29, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	53	274	E	1600	1205	1335	680	45
2	76	274	W	1650	1415	1515	1361	
3	91	274	W	1650	1555	1710	2722	
4	82	274	WSW		1745	1805	907	
5	87	274	ESE	1650	1835	1930	1814	
6	62	274	WSW	1650	1955	2045	1814	

Location	Latitude	Longitude
Start	51° 29' N	56° 42' W
Finish	51° 31' N	56° 40' W

Total Catch (Actual Weight) (Kg) 9366 Total Fishing Time 5 hr 50 Min

Remarks: Not having any problem getting over bottom despite the fact that several boats towing near us have badly damaged their nets.

Trawl I.C. Vessel Ocean Floor II Date AUG. 29 Tow No. 3 Catch 2722 kg cod

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Engel Date August 29, 1978

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	58	228	W	1500	1155	1320	2041	
2	58	228	W	1500	1410	1510	680	
3	58	228	W	1500	1535	1635	3402	
4	58	228	W	1500	1655	1830	2041	

Location	Latitude	Longitude
Start	51° 29' N	56° 42' W
Finish	51° 31' N	56° 40' W

Total Catch (Actual Weight) (Kg) 9475 Total Fishing Time 5 hr

Remarks: All the boats in the area are having trouble with tearing nets on bad bottom. We have lost the bellie and extensions on two tows.

Trawl Engel Vessel Starcraft Date Aug. 29 Tow No. 3 Catch 3402 kg cod

Vessel Name Ocean Floor II Captain's Name Chesley Genge

Trawl Iver Christensen Date August 30, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	59	274	ESE	1700	0725	0835	907	
2	64	274	SE	1700	0935	1035	1814	
3	59	274	W	1700	1100	1145	907	
4	51	183	ESE	1700	1220	1350	1134	
5	64	274	WSW	1700	1415	1515	680	
6	64	274	SW	1700	1620	1820		

Location Latitude Longitude

Start _____ _____

Finish _____ _____

Total Catch (Actual Weight) (Kg) 4989

Total Fishing Time 7 hr 25 Min

Remarks:

Trawl I.C. Vessel Ocean Floor II Date AUG. 30 Tow No. 2 Catch 1814 kg cod

Vessel Name Starcraft Captain's Name Winston Genge

Trawl Engel Date August 30, 1979

Set No.	Depth of Water (Meters)	Length of Warp (Meters)	Dir. of Tow (Compass)	Engine R.P.M.	Dur. of Tow		Catch (Est.)	
					Time Set	Time Hauled	Cod (Kg)	Other (Kg)
1	64	228	ESE	1500	0745	0845	544	
2	64	228	SE	1500	0950	1040	1134	
3	64	228	W	1500	1100	1130	1134	

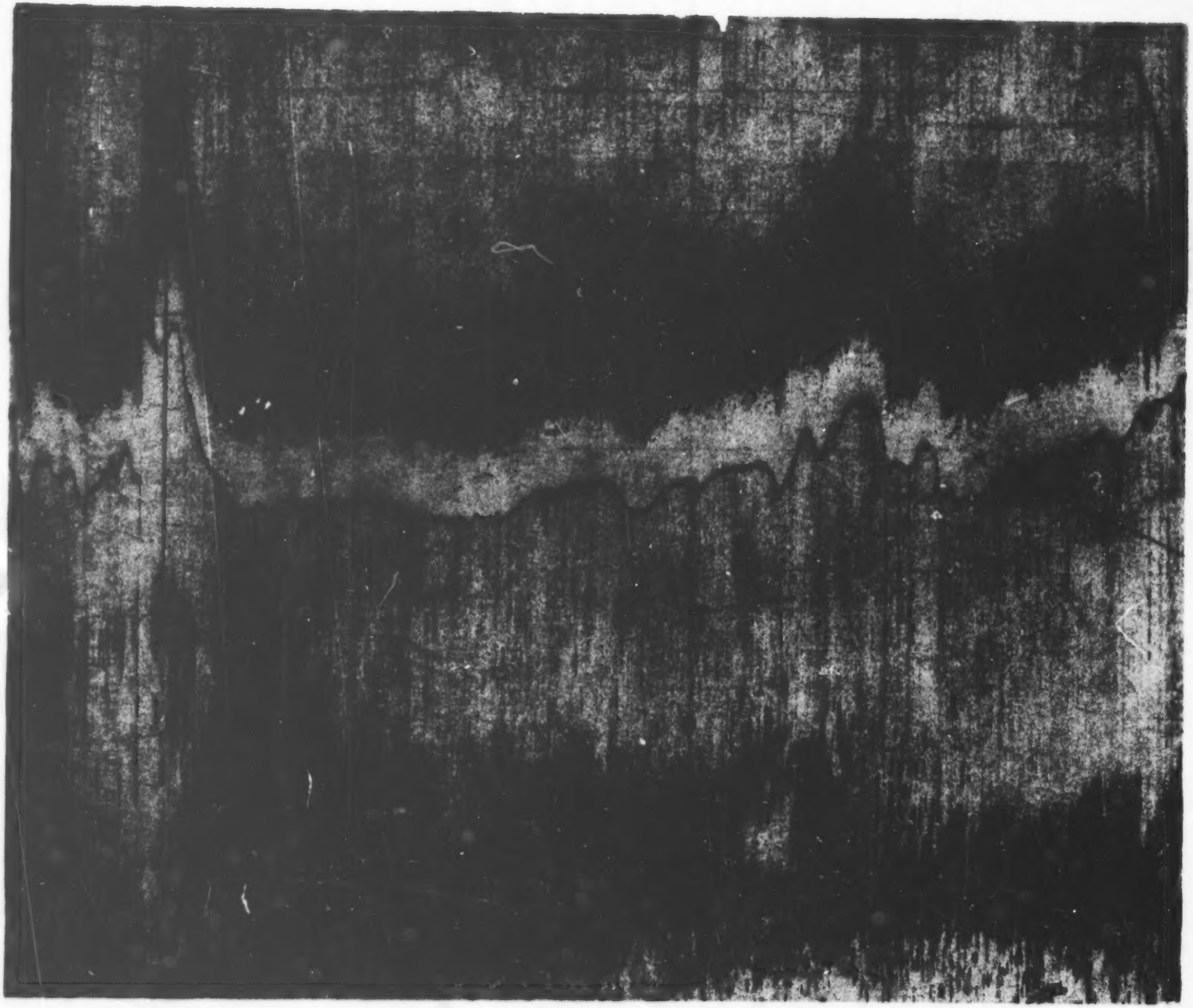
Location

Start Latitude _____ Longitude _____

Finish _____ _____

Total Catch (Actual Weight) (Kg) 3220 Total Fishing Time 2 hr 20 Min

Remarks: Had to return to port. Trawl too badly damaged to continue fishing. Sea conditions very rough, heavy swell.



Trawl Engel Vessel Starcraft Date Aug. 30 Tow No.(ALL) Catch 2812 kg cod

Appendix II

Instrumentation Data

M. V. STRAITS PRIDE

BOLLARD PULL VS rpm

LOA - 17.5M, ENGINE - 325 HP. VOLVO

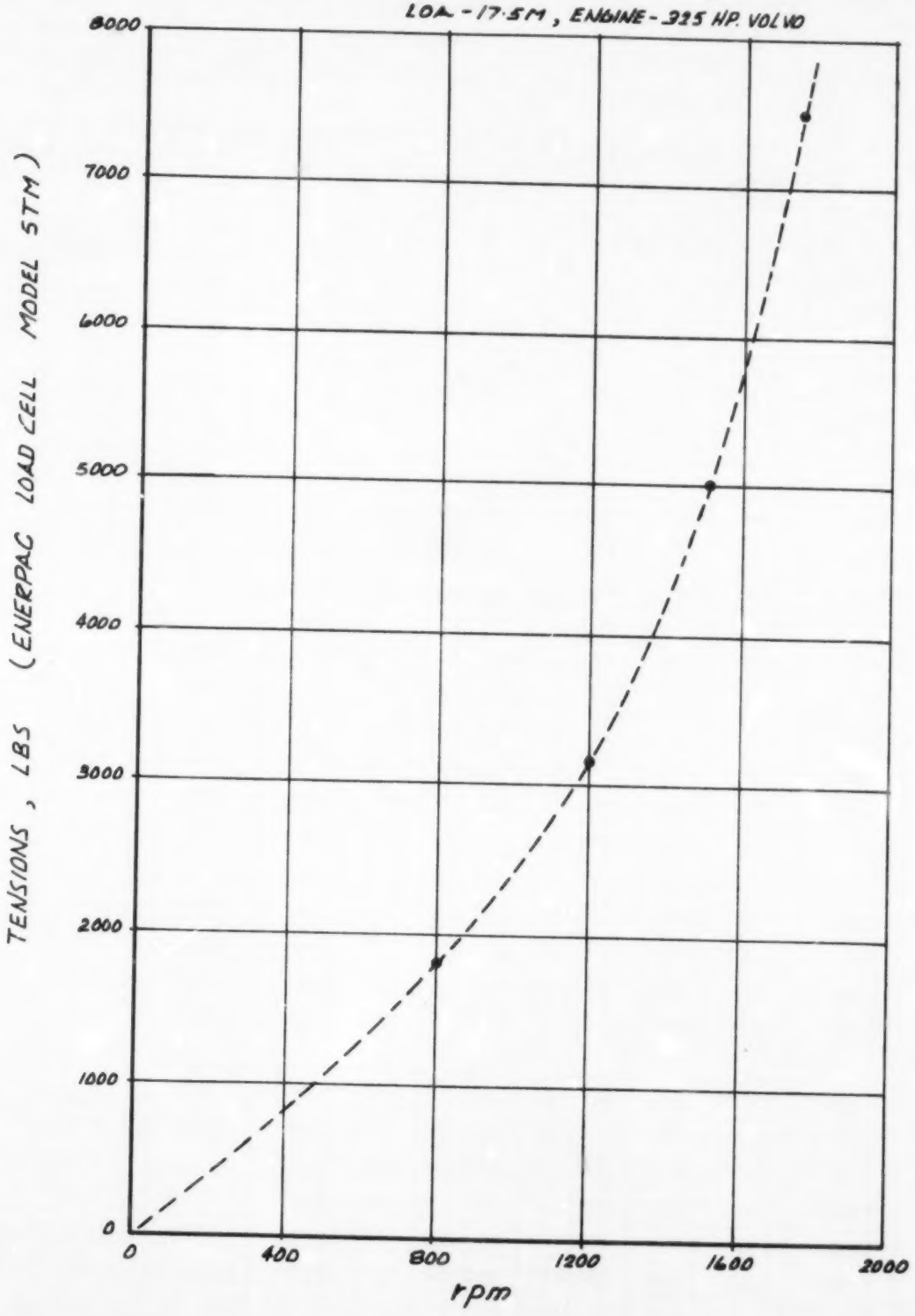


FIGURE VII

Type Trawl ENGEL
Warp Diameter 1.27cm
Warp Length 231 m
Door Size 2.3 m x 1.3 m
Depth 70m - 83m

Vessel Name STRAITS PRIDE
Date September 18, 1979
Ship Heading Compass W
Wind Direction W
Sea Condition Fair

Time	Log Ship Speed (Knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
1732	2.0	1500	79	272	105	93	255	264	51	909	909	5.8	23.3
1737	2.4	1500	81	298	118	80	242	250	64	909	909	6.7	22.1
1742	2.4	1500	81	171	55	82	169	174	43	909	909	7.3	21.4
1746	2.4	1500	81	248	107	119	244	252	66	909	909	6.6	21.7
1751	2.4	1500	81	275	147	106	245	280	42	909	909	6.9	21.0
1756	2.3	1500	79	262	147	107	207	252	42	909	909	6.1	20.6
1801	2.3	1500	79	248	146	106	232	239	66	909	909	6.3	20.8
1801	2.3	1500	79	287	173	133	270	279	53	909	909	5.4	20.8
1082	2.4	1500	78	207	105	78	191	224	79	909	909	6.2	20.8
1804	2.75	1600	78	271	157	116	254	302	76	1000	1000	6.0	20.2
1807	2.7	1600	78	323	183	156	291	316	115	1000	1000	6.0	20.3
1810	3.0	1600	78	337	197	144	283	303	103	1000	1000	5.4	20.8
1813	3.0	1600	74	310	170	143	228	210	76	1000	1000	5.9	20.8
1815	3.0	1600	74	309	169	155	215	222	88	1000	1000	5.5	21.1
1819	3.0	1600	74	335	195	153	239	262	74	1000	1000	5.4	20.8
1821	3.0	1600	74	271	157	128	239	276	63	1000	1000	5.2	20.6
1823	3.0	1600	74	284	170	155	280	302	115	1000	1000	6.4	20.4
1826	3.0	1600	81	298	184	144	319	356	129	1000	1000	5.9	19.9
1828	3.0	1600	81	209	133	93	293	317	103	1000	1000	6.3	19.9
1830	3.5	1700	81	302	187	121	334	359	106	1023	1023	6.3	19.7
1834	3.5	1700	81	340	214	160	257	292	53	1023	1023	4.9	20.4
1837	3.5	1700	81	184	214	68	333	227	54	1023	1023	5.2	20.6
1839	3.5	1700	81	365	239	159	334	359	106	1023	1023	5.4	20.4
1841	3.5	1700	81	300	186	133	258	320	67	1023	1023	6.3	19.7
1848	3.5	1700	76	272	184	117	204	250	64	1023	1023	6.0	19.6

Type Trawl ENGEL

Warp Diameter 1.27cm

Warp Length 231 m

Door Size 2.3m x 1.3m

Depth 70m - 83m

Vessel Name STRAITS PRIDE

Date September 18, 1979

Ship Heading Compass W

Wind Direction W

Sea Condition Fair

Time	Log Ship Speed (Knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
1850	3.5	1700	76	376	250	183	250	277	90	1023	1023	5.5	19.7
1853	3.5	1700	76	361	262	221	279	301	114	1023	1023	6.2	20.1
1855	3.5	1700	74	258	223	143	256	276	76	1023	1023	6.6	20.3
1857	3.5	1700	74	322	222	142	317	354	75	1023	1023	5.9	19.5
1859	3.5	1700	74	258	183	116	250	422	112	1023	1023	5.3	19.5

Type Trawl: ENGEL
Warp Diameter: 1.27 cm
Warp Length: 231 m
Door Size: 2.3m x 1.3m
Depth: 70m - 83m

Vessel Name: STRAITS PRIDE
Date: September 18, 1979
Ship Heading Compass: E
Wind Direction: W
Sea Condition: Fair

Time	Log Ship Speed (Knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
1911	2.7	1500	83	300	276	133	169	214	42	909	909	6.4	19.2
1915	2.7	1500	83	326	266	133	200	332	53	909	909	6.2	19.2
1916	2.7	1500	83	289	241	116	258	293	67	909	909	6.4	19.2
1918	2.7	1500	83	276	241	121	246	334	55	909	909	6.3	19.2
1920	2.7	1500	83	328	254	148	234	294	107	909	909	6.0	19.2
1922	2.7	1500	83	406	307	187	200	321	107	909	909	5.8	19.2
1925	2.7	1500	83	315	215	161	246	251	81	909	909	7.3	19.2
1927	2.7	1500	83	302	228	162	246	294	81	909	909	6.9	19.2
1930	2.7	1500	83	368	255	125	260	388	95	909	909	6.4	19.2
1932	2.7	1500	83	252	150	137	210	190	70	909	909	6.0	19.2
1934	2.7	1500	83	278	190	150	273	295	69	909	909	6.6	19.2
1936	2.7	1500	83	368	269	201	311	348	108	909	909	5.8	19.2
1938	2.7	1500	83	291	217	110	286	296	70	1000	1000	6.6	19.2
1940	2.7	1500	83	277	202	122	286	335	95	1000	1000	5.7	19.1
1944	3.0	1600	83	262	174	134	272	399	68	1045	1023	5.8	19.2
1946	3.0	1600	83	275	200	147	280	373	106	1045	1023	6.1	19.2
1948	3.0	1600	79	326	239	146	309	359	119	1045	1023	6.3	19.2
1952	3.0	1600	79	365	239	117	295	305	118	1045	1023	5.4	19.2
1955	3.0	1600	79	353	253	160	284	346	67	1045	1023	6.8	19.2
1956	3.0	1600	79	404	292	198	306	370	103	1045	1023	5.5	19.2
1958	3.0	1600	79	366	240	160	206	306	66	1045	1023	5.5	19.2
1959	3.0	1600	79	379	279	173	244	266	92	1045	1023	6.6	19.2
2000	3.0	1600	79	431	279	199	283	319	79	1045	1023	5.8	19.2
2002	3.0	1600	83	366	280	160	245	320	80	1045	1023	6.2	19.1
2005	3.0	1600	83	367	294	174	271	346	67	1045	1023	6.4	19.2
2007	3.0	1600	83	406	294	147	272	307	107	1045	1023	5.5	19.2
2010	3.0	1600	83	274	199	133	346	411	118	1045	1023	5.7	19.1

Type Trawl ENGEL

Warp Diameter 1.27 cm

Warp Length 231 m

Door Size 2.3m x 1.3m

Depth 70m - 83m

Vessel Name STRAITS PRIDE

Date September 18, 1979

Ship Heading Compass E

Wind Direction W

Sea Condition Fair

Time	Log Ship Speed (knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
2012	3.2	1700	83	341	281	148	322	440	93	1045	1045	5.8	19.2
2015	3.3	1700	83	380	281	174	335	400	120	1045	1045	6.4	19.0
2016	3.4	1700	81	430	332	185	308	385	118	1045	1045	6.6	19.2
2018	3.4	1700	81	430	319	185	334	386	132	1045	1045	6.4	19.2
2019	3.4	1700	81	274	293	106	334	426	119	1045	1045	5.4	19.0
2020	3.3	1700	81	353	267	173	360	426	132	1045	1045	5.8	19.2
2022	3.7	1700	81	355	279	172	333	398	118	1045	1045	5.6	19.2
2024	3.7	1700	74	378	292	172	255	317	116	1045	1045	5.4	21.0
2025	3.7	1700	74	352	266	159	217	277	64	1045	1045	5.7	19.2
2026	3.7	1700	74	401	316	195	318	317	115	1045	1045	5.4	19.2
2027	3.7	1700	74	414	329	209	330	422	141	1045	1045	5.5	19.2
2028	3.7	1700	74	402	290	157	331	396	116	1045	1045	5.0	19.2

Type Trawl: IVER CHRISTENSEN
Warp Diameter: 1.27 cm
Warp Length: 231 m
Door Size: 2.3 m x 1.3 m
Depth: 74m - 83m

Vessel Name: STRAITS PRIDE
Date: September 22, 1979
Ship Heading Compass: W
Wind Direction: W
Sea Condition: Fair

Time	Log Ship Speed (Knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
1150	3.0	1500	83	502		44	513		174	909	909	4.7	15.0
1151	3.0	1500	81	173		80	258		160	909	909	4.7	15.0
1152	3.0	1500	81	317		93	346		173	909	909	4.5	15.0
1153	3.0	1500	83	515		25	246		95	909	909	5.0	15.0
1155	3.0	1500	83	386		83	451		135	909	909	4.6	14.8
1158	3.0	1500	83	333		57	437		188	909	909	5.0	14.6
1200	3.0	1500	83	286		71	427		203	909	909	4.8	14.4
1205	3.0	1500	83	426		35	375		110	909	909	4.7	14.6
1205	3.0	1500	83	517		136	515		255	909	909	4.8	14.4
1205	3.0	1500	83	268		45	248		124	909	909	4.6	14.6
1206	3.0	1500	83	413		58	337		110	909	909	4.4	14.6
1208	3.0	1500	81	255		58	274		163	909	909	4.4	14.9
1211	3.0	1500	83	545		111	427		190	909	909	4.4	14.7
1214	3.0	1500	83	516		162	374		201	909	909	4.4	14.7
1216	3.5	1600	83	346		70	336		136	1000	1000	4.3	14.5
1222	3.5	1600	83	547		137	401		149	1000	1000	4.6	14.3
1225	3.5	1600	83	479		124	415		203	1000	1000	4.5	14.4
1230	3.5	1600	83	281		71	478		150	1000	1000	4.5	14.7
1235	3.5	1600	83	412		83	400		123	1000	1000	4.4	14.5
1240	3.5	1600	83	504		96	337		164	1000	1000	4.4	14.2
1245	3.5	1600	83	491		110	387		149	1000	1000	4.6	14.6
1247	3.8	1700	83	650		150	465		164	1227	1227	5.1	14.2
1252	3.8	1700	83	818		227	526		187	1227	1227	4.8	13.9
1253	3.8	1700	83	673		174	395		141	1227	1227	4.8	14.2
1258	3.8	1700	81	556		135	463		162	1227	1227	5.1	13.8
1303	3.8	1700	81	583		163	528		282	1227	1227	4.3	15.0
1308	3.8	1700	81	620		134	640		187	1227	1227	4.5	14.2
1313	3.8	1700	81	556		148	565		175	1227	1227	4.5	14.5
1314	3.8	1700	81	557		110	540		149	1227	1227	4.0	13.9

Type Trawl: IVER CHRISTENSEN
Warp Diameter: 1.27 cm
Warp Length: 231 m
Door Size: 2.3 m x 1.3 m
Depth: 81m - 83m

Vessel Name: STRAITS PRIDE
Date: September 22, 1979
Ship Heading Compass: E
Wind Direction: W
Sea Condition: Fair

Time	Log Ship Speed (Knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
1330	3.0	1500	83	456		114	187		74	1045	1045	4.2	14.3
1332	3.0	1500	83	424		122	259		135	1045	1045	4.8	15.0
1337	3.0	1500	83	529		148	476		161	1045	1045	4.8	14.8
1342	3.0	1500	83	635		141	515		188	1045	1045	4.7	14.4
1347	3.0	1500	83	542		147	564		200	1045	1045	4.6	14.7
1352	3.0	1500	81	490		135	297		152	1045	1045	4.0	15.0
1357	3.0	1500	81	556		148	476		162	1045	1045	4.5	14.6
1402	3.4	1600	83	594		149	566		176	1182	1182	5.1	14.1
1407	3.4	1600	83	558		164	363		164	1182	1182	5.2	14.9
1412	3.4	1600	79	503		162	437		162	1182	1182	4.6	14.9
1417	3.4	1600	78	370		81	411		134	1182	1182	4.5	14.6
1422	3.2	1600	78	462		120	790		303	1182	1182	5.3	14.4
1427	3.1	1600	78	634		174	589		200	1182	1182	4.6	14.6
1430	3.8	1700	81	764		252	512		252	1341	1341	5.4	14.0
1435	3.8	1700	81	780		229	566		229	1341	1341	4.9	14.0
1440	3.8	1700	81	753		215	617		229	1341	1341	5.0	14.0
1445	3.8	1700	81	635		175	565		201	1341	1341	5.5	14.0
1450	3.8	1700	81	660		161	577		187	1341	1341	4.8	14.3
1455	3.8	1700	81	675		189	500		174	1341	1341	4.5	14.5

Type Trawl: YANKEE 36
Warp Diameter: 1.27
Warp Length: 231 m
Door Size: 2.3 m x 1.3 m
Depth: 73 m

Vessel Name: STRAITS PRIDE
Date: September 21, 1979
Ship Heading Compass: W
WindDirection: W
Sea Condition: Fair

Time	Log Ship Speed (Knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
1015	3.0	1450	74	207		144	181		191	861	861	2.6	11.6
1020	3.0	1450	74	245		182	284		280	861	861	2.6	11.5
1025	3.0	1450	78	235		185	220		283	861	861	2.7	11.3
1030	3.0	1450	76	194		210	274		270	861	861	2.9	11.2
1035	3.0	1450	76	155		198	142		193	861	861	3.2	11.6
1040	3.5	1500	76	248		262	220		308	909	909	2.8	11.1
1045	3.5	1500	81	236		226	262		309	909	909	2.7	11.0
1050	3.5	1500	83	159		148	172		183	909	909	2.9	10.9
1055	3.5	1500	78	248		251	196		270	909	909	2.8	11.2
1100	3.5	1500	78	222		291	196		308	909	909	2.9	11.3
1105	3.5	1500	78	222		251	259		344	909	909	3.1	11.0
1110	3.5	1600	81	224		239	198		246	909	909	2.7	10.6
1115	3.5	1600	83	238		266	264		349	909	909	2.9	10.4
1120	3.5	1600	85	199		228	160		260	909	909	3.2	10.4
1125	3.5	1600	87	186		241	147		298	909	909	2.7	10.4
1130	3.5	1600	85	161		215	161		236	909	909	3.0	10.2

Type Trawl YANKEE 36
Warp Diameter 1.27 cm
Warp Length 231 m
Door Size 2.3 m x 1.3 m
Depth 73 m

Vessel Name STRAITS PRIDE
Date September 21, 1979
Ship Heading Compass E
Wind Direction W
Sea Condition Fair

Time	Log Ship Speed (Knots)	Engine R.P.M.	Depth (m)	Bridle Tensions at Wing End (Kg)						Ship End Warp Tensions		Centre Headline Height (m)	Wing Spread (m)
				Starboard			Port			Stbd.	Port		
				Tt	Tc	Tb	Tt	Tc	Tb	kg.	kg.		
1149	2.7	1450	85	172		121	148		208	909	909	2.4	11.4
1154	2.7	1450	85	218		228	160		286	909	909	2.6	10.6
1159	2.7	1450	85	199		188	173		222	909	909	2.9	10.4
1204	2.7	1450	85	304		308	213		299	909	909	2.7	10.4
1209	2.7	1450	85	225		215	187		247	909	909	2.8	10.3
1214	2.9	1450	81	209		198	196		244	909	909	2.9	10.4
1219	3.5	1500	79	207		210	181		255	909	909	2.6	10.1
1224	3.5	1500	78	233		210	155		230	909	909	2.8	10.2
1229	3.5	1500	81	262		213	223		258	909	909	2.6	10.1
1234	3.5	1500	78	289		253	237		285	909	909	2.7	10.1
1239	3.5	1500	78	311		289	272		344	909	909	2.6	10.1
1244	3.5	1500	76	235		185	196		244	909	909	2.6	10.0
1254	3.5	1550	81	366		397	261		346	909	909	2.7	9.9
1259	3.5	1550	76	482		475	233		293	909	909	2.9	10.2
1304	3.5	1550	76	440		459	305		471	909	909	2.7	10.0
1309	3.5	1550	94	272		262	272		344	909	909	2.4	9.8
1314	3.5	1550	72	272		262	220		268	909	909	2.4	10.0

POOR

QUALITY

ORIGINAL